FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

All sections must be addressed, or the application will be considered invalid

I. APPLICANT INFORMATION

A. Applicant Name: Christine Brissette, Trout Unlimited

Mailing Address: 312 N. Higgin St

City: Missoula State: MT Zip: 59802

Telephone: 406-544-9649 E-mail: cbrissette@tu.org

B. Contact Person (if different than applicant): _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____ E-mail: _____

C. Landowner and/or Lessee Name (if different than applicant): Bitterroot National Forest (Seth Carbonari, District Ranger)

Mailing Address: 1801 North 1st St

City: Hamilton State: MT Zip: 59840

Telephone: 406-363-7100 E-mail: scarbonari@fs.fed.us

II. PROJECT INFORMATION

A. Project Name: Wilson Ditch Fish Screen, Upper West Fork Bitterroot River

River, stream, or lake: West Fork Bitterroot River

Location: Township: 4S Range: 22W Section: 4

Latitude: 45.524158 Longitude: -114.318442 *within project (decimal degrees)*

County: Ravalli

B. Purpose of Project:

The Wilson Ditch Fish Screen project will eliminate native trout entrainment in a ditch that diverts water from some of the highest quality Bull Trout and Westslope Cutthroat Trout habitat in the Bitterroot Watershed. In a 2017 prioritization of Bitterroot Irrigation Ditches by Trout Unlimited, Montana FWP and Bitterroot National Forest, this project ranked among the highest for Bull trout conservation in the Upper Bitterroot based on the following:

1. The Wilson ditch is located on the West Fork Bitterroot River, above Painted Rocks reservoir. This adfluvial Bull trout population is recognized as one of the highest conservation priorities in the Bitterroot because of the long-term cold water refugia predicted for these waterbodies, and its generally intact habitat.
2. The Wilson ditch diverts water from a known Bull trout spawning reach. The fishery as a whole is dominated by native species, making this project a key opportunity to reduce juvenile and young-of-year entrainment and enhance native populations.
3. The diversion is located high in the watershed and is fairly isolated. This means that this relatively small project has the potential for substantial impacts. Once installed, this screen would reconnect 39 miles of Bull trout critical habitat.

This project was submitted to Future Fisheries in Fall 2018 and recommended for full funding. However, the project ultimately did not rank high enough in the prioritization for the limited money available that cycle. We plan to complete this project in 2019 if funding is secured.

C. Brief Project Description (attach additional information to end of application):

Trout Unlimited will install a passive, self-cleaning corrugated water screen in the Wilson ditch to eliminate native trout entrainment. The Wilson ditch was silted in following fires in the upper watershed and is currently inactive. When TU became aware of the water users' intention to reactivate the ditch, we initiated conversations to include a fish screen in the design. The combination of the diversion's location in the watershed, proximity to native strongholds and spawings reaches, and the opportunity to share expense and effort with the water users made this a high priority diversion for TU and regional biologists.

In 2018, TU led conversations with the water users on the Wilson ditch and contracted the survey and design of this project using Bitterroot NF funds. Great West Engineering developed conceptual designs and cost estimates for 3 fish screen alternatives (Coanda, FCA and Corrugated Water Screen). Ultimately, the corrugated water screen was selected based on ease of maintenance for the water user, proven success passing young-of-year and juvenile fish (the target of this project), and cost (the corrugated water screen cost $26,700 less than the FCA screen, the next best alternative). Please see Appendix H for a detailed description of corrugated water screens.

The resulting design and cost estimate include a fish screen, a diversion upgrade and ditch regrading to ensure sufficient flows and slope for screen function. Water users will contribute $7,500 to the project (12% of total costs) to cover the majority of the expense associated with reactivating the ditch and installing a headgate. TU has talked at length with the water users who are supportive of the project and have agreed to operate and maintain the screen in exchange for financial support for the diversion infrastructure upgrade (see attached draft agreement). The property has been in the family for over 3 generations and will be leased for haying to a downstream neighbor.

The West Fork Bitterroot River, at this location, is a perennial stream with 12-foot bankfull width and 3-foot bankfull depth. Baseflows were measured at 10 cfs and are predicted to peak at 60 cfs (1.5 year flood) or 160 cfs (10 year flood) (Sando et al 2015). Median substrate size is 7mm. The ditch runs for 1000 feet before reaching 45 acres of flood-irrigated hay ground and is associated with a 1.7 cfs water right.

D. Length of stream or size of lake that will be treated: 30 ft of stream will be impacted at the point of diversion, 1.7 cfs of diverted water will be screened (15% of baseflow)

E. Project Budget:

Grant Request (Dollars):	**$**	**30,630**
Matching Dollars:	**$**	**29,613**
Matching In-Kind Services:*	**$**	**1,500**

**salaries of government employees are not considered matching contributions*

Total Project Cost: $ 61,743

F. **Attach** itemized (line item) budget – *see budget template*

G. **Attach** specific project plans, detailed sketches, plan views, photographs, maps, evidence of landowner consent, evidence of public support and fish biologist support, and/or other information necessary to evaluate the merits of the project. If project involves water leasing or water salvage complete a *supplemental questionnaire.* (http://fwp.mt.gov/fwpDoc.html?id=36110)

H. **Attach** land management & maintenance plans that will ensure protection of the reclaimed area.

III. PROJECT BENEFITS (attach additional information to end of application):

A. What species of fish will benefit from this project?

Bull trout (adfluvial population), westslope cutthroat trout, brook trout (site is largely dominated by native fish species)

B. How will the project protect or enhance wild fish habitat?

The project will primarily protect juvenile and young of year native trout from entrainment in an irrigation diversion along a known bull trout spawning reach in the upper West Fork Bitterroot River.

C. Will the project improve fish populations and/or fishing? To what extent?

Yes. The project will reduce entrainment of juvenile and young of year native trout, thereby enhancing populations.

D. Will the project increase public fishing opportunity for wild fish and, if so, how?

Yes. The majority of the surrounding land is owned by Bitterroot National Forest, with full public access for fishing.

E. The project agreement includes a 20-year maintenance commitment. Please discuss your ability to meet this commitment.

TU, BNF and water users on the diversion will enter into a funding, operation and maintenance agreement that will include a 20-year maintenance commitment (see attached draft agreement). While the irrigator will assume primary maintenance responsibilities, Bitterroot NF is the landowner at the point of diversion, with staff available to visit the site when working in the area. TU, additionally, is committed to ensuring the function of the screen and will be the point of contact for irrigators if problems arise.

F. What was the cause of habitat degradation in the area of this project and how will the project correct the cause?

The Wilson water right dates back to 1910, meaning that for over a century, this ditch has entrained native West Fork Bitterroot trout. Our project will eliminate this entrainment hazard by screening the ditch.

G. What public benefits will be realized from this project?

The project will enhance native fish populations in publicly-accessible streams

H. Will the project interfere with water or property rights of adjacent landowners? (explain):

No. The water users on this diversion are supportive of this project (and are contributing $7,500 to its construction) and will maintain full access to their water right with this design. The Bitterroot National Forest is the landowner and is also supportive of the project (see attached letter).

I. Will the project result in the development of commercial recreational use on the site? (explain):

No

J. Is this project associated with the reclamation of past mining activity?

No

Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.

IV. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature: Christine Brissette Date: May 31, 2019

Sponsor (if applicable): _____

Submittal: **Applications must be *signed and received before* December 1 and June 1 of each year to be considered for the subsequent funding period**. Late or incomplete applications will be rejected.

Mail to:	Montana FWP Fish Management Bureau PO Box 200701 Helena, MT 59620-0701	Email:	Michelle McGree mmcgree@mt.gov (electronic submissions must be signed) For files over 10MB, use https://transfer.mt.gov

Applications may be rejected if this form is modified.

West Fork Bitterroot Wilson Ditch fish screen

Both tables must be completed or the application will be returned

WORK ITEMS (ITEMIZE BY CATEGORY)	NUMBER OF UNITS	UNIT DESCRIPTION*	COST/UNIT	TOTAL COST	CONTRIBUTIONS			
					FUTURE FISHERIES REQUEST	IN-KIND SERVICES**	IN-KIND CASH	TOTAL
Personnel* **								
Survey	1	lump sum	$4,175.00	$ 4,175.00	-		$4,175.00	$ 4,175.00
Design	1	lump sum	$9,600.00	$ 9,600.00	-		$9,600.00	$ 9,600.00
Permitting	8	hours	$45.00	$ 360.00	-		360.00	$ 360.00
Pre-construction site visit/contractor coordination (TU)	10	hours	$45.00	$ 450.00			450.00	$ 450.00
Landowners/water user Coordination (TU)	30	hours	$45.00	$ 1,350.00	-		1,350.00	$ 1,350.00
Construction oversight (TU)	40	hours	$45.00	$ 1,800.00	1,000.00		800.00	$ 1,800.00
			Sub-Total	$ 17,735.00	$ 1,000.00	$ -	$16,735.00	$ 17,735.00
Travel								
Mileage	400	miles	$0.55	$ 218.00			218.00	$ 218.00
Per diem				$ -		-		$ -
			Sub-Total	$ 218.00	$ -	$ -	$ 218.00	$ 218.00
Construction Materials** **								
Screen and box, sandblast/paint	1	screen	$14,600.00	$ 14,600.00	10,100.00		4,500.00	$ 14,600.00
Headgate & Sluice gate	1	headgate/sluice b	$6,000.00	$ 6,000.00	-		6,000.00	$ 6,000.00
Fish return pipe, 12" PIP	27	linear foot	$25.00	$ 675.00	675.00			$ 675.00
Sluice gate return 12" CSP	6	linear foot	$40.00	$ 240.00	240.00			$ 240.00
Seed	20	pounds	$20.00	$ 400.00	400.00			$ 400.00
Plants	50	plants	$4.00	$ 200.00	200.00			$ 200.00
24" rock (furnished)	8	cubic yard	$200.00	$ 1,600.00	1,600.00			$ 1,600.00
18" minus rock (furnished)	4	cubic yard	$120.00	$ 480.00	480.00			$ 480.00
			Sub-Total	$ 24,195.00	$ 13,695.00	$ -	$ 10,500.00	$ 24,195.00
Equipment and Labor								
Construction staking	1	lump sum	$750.00	$ 750.00	750.00			$ 750.00
Erosion control and dewatering	1	lump sum	$2,000.00	$ 2,000.00	2,000.00			$ 2,000.00
Clearing and grubbing	1	lump sum	$800.00	$ 800.00	800.00			$ 800.00
Ditch Excavation	240	cubic yard	$18.00	$ 4,320.00	660.00	1,500.00	2,160.00	$ 4,320.00
Excavation (screen, headgate, return pipe)	1	lump sum	$2,500.00	$ 2,500.00	2,500.00			$ 2,500.00
Install Fish screen	1	lump sum	$1,400.00	$ 1,400.00	1,400.00			$ 1,400.00

			West Fork Bitterroot Wilson Ditch fish screen					
Install Headgate/Sluice gate	1	lump sum	$1,200.00	$ 1,200.00	1,200.00			$ 1,200.00
Spider excavator	5	hours	$225.00	$ 1,125.00	1,125.00			$ 1,125.00
Dump track	5	hours	$100.00	$ 500.00	500.00			$ 500.00
			Sub-Total	$ 14,595.00	$ 10,935.00	$ 1,500.00	$ 2,160.00	$ 14,595.00
Mobilization								
Mobilization	1	lump sum	$5,000.00	$ 5,000.00	5,000.00			$ 5,000.00
				$ -				$ -
				$ -				$ -
				$ -				$ -
			Sub-Total	$ 5,000.00	$ 5,000.00	$ -	$ -	$ 5,000.00
			TOTALS	$ 61,743.00	$ 30,630.00	$ 1,500.00	$29,613.00	$ 61,743.00

OTHER REQUIREMENTS:

All of the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for additional clarification.

*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

**Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used for calculations). Describe here or in text.: Water user is providing $1500 in-kind equipment time

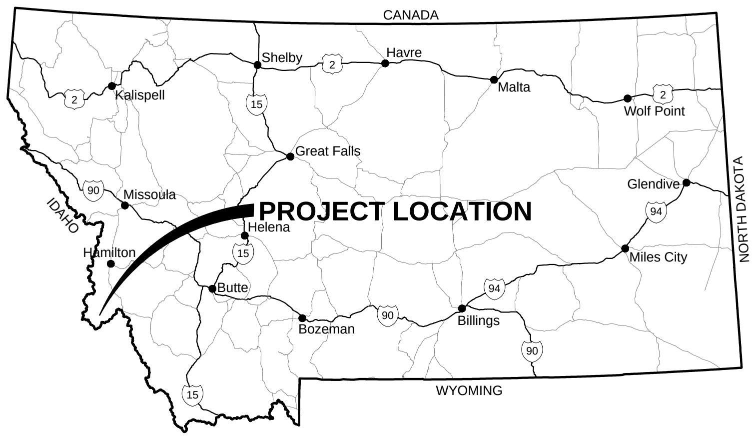
Reminder: Government salaries cannot be used as in-kind match

***The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a minimum of two competitive bids for the cost of undertaking the project.

****The Review Panel recommends a maximum fencing cost of $1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

MATCHING CONTRIBUTIONS (do not include requested funds)

CONTRIBUTOR	IN-KIND SERVICE	IN-KIND CASH	TOTAL	Secured? (Y/N)
Bitterroot National Forest	$ -	$13,613.00	$ 13,613.00	Y
Bitterroot Chapter Trout Unlimited	$ -	$ 5,000.00	$ 5,000.00	Y
Montana Trout Unlimited	$ -	$ 5,000.00	$ 5,000.00	Y
Water Users	$ 1,500.00	$ 6,000.00	$ 7,500.00	Y
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ 1,500.00	$29,613.00	$ 31,113.00	

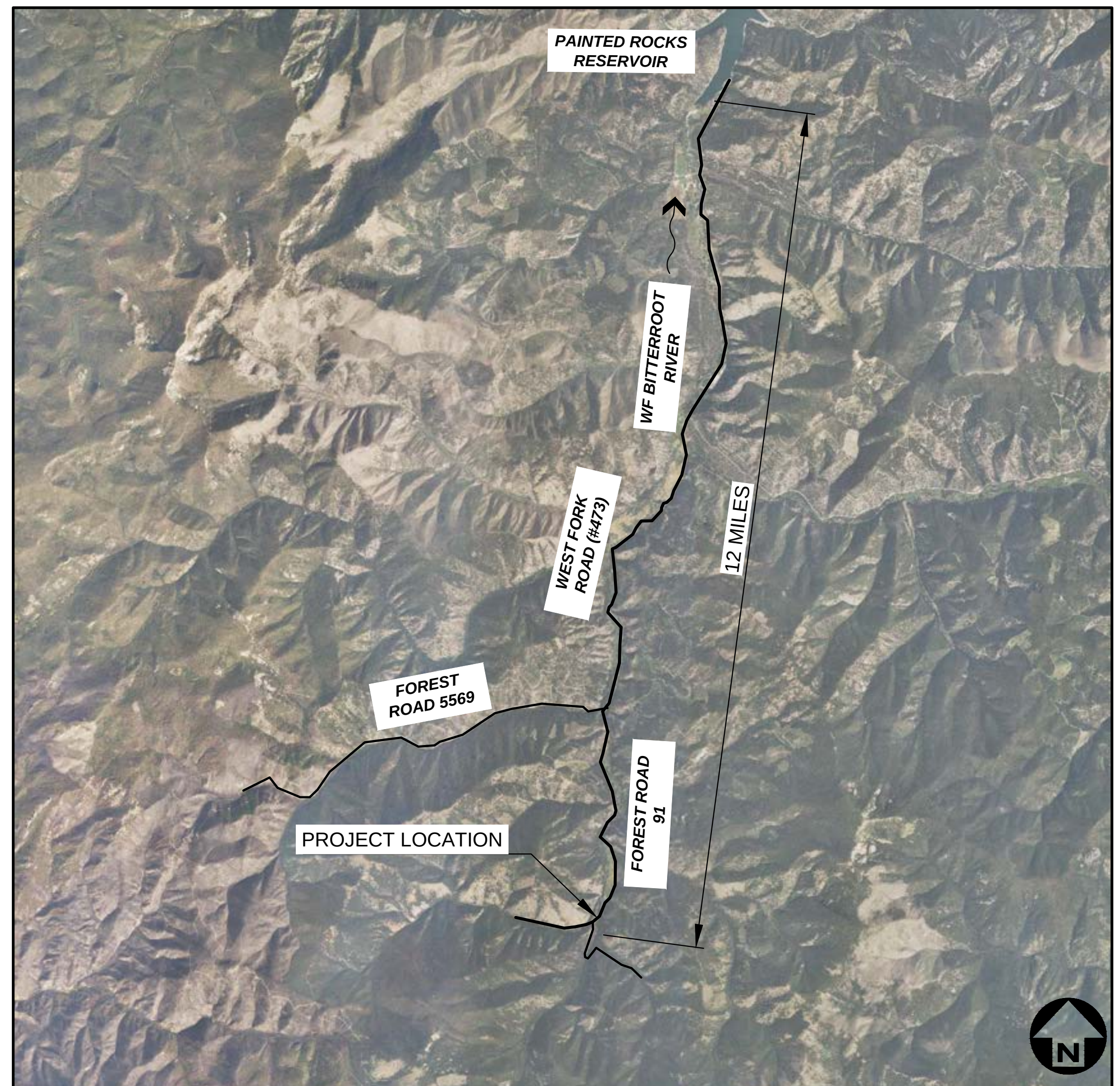


TROUT UNLIMITED

WEST FORK BITTERROOT DIVERSION & FISH SCREEN

95% SUBMITTAL

SECTION PB40, TOWNSHIP 4S, AND RANGE 22W
LAT: 45.524295°, LONG: -114.318782°



NOT TO SCALE

SHEET INDEX

PROJECT: 1-18266
DATE: MAY 29, 2019

SHEET 1	COVER
SHEET 2	LEGEND & GENERAL NOTES
SHEET 3	OVERALL SITE PLAN & CONTROL DIAGRAM
SHEET 4	NEW DITCH, HEADGATE AND FISH SCREEN PLAN & PROFILE
SHEET 5	HEADGATE DETAILS
SHEET 6	FISH SCREEN DETAILS
SHEET 7	FISH SCREEN DETAILS
SHEET 8	FISH RETURN PIPE PLAN & PROFILE
SHEET 9	DIVERSION PLAN, PROFILE & DETAILS

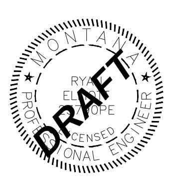
OWNER FURNISHED ITEMS:
- CORRUGATED WATER SCREEN
- STEEL MODULAR FISH SCREEN BOX
- STEEL MODULAR HEADGATE & SLUICE GATE

PLANS PREPARED FOR:

TROUT UNLIMITED

PREPARED BY:

RYAN ELLIOTT, P.E.
GREAT WEST ENGINEERING, INC.



GreatWest engineering®
2501 BELT VIEW DRIVE
HELENA, MT 59601
(406)449-8627

F:\1-18266-TU Bitterroot Fish Screen & Diversion Designs\CADD 1-18266-West Fork\Sheets\1-18266-WF-01-Cover.dwg

NO.	REVISION DESCRIPTION	BY	DATE
△			
△			
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△			

SET NO.

SHEET NO.
1

ABBREVIATIONS

@	AT	LPG	LIQUID PROPANE GAS
Δ	ANGLE OF DEFLECTION, DELTA ANGLE	LT	LEFT
<PT	ANGLE POINT	MAX	MAXIMUM
AB	ANCHOR BOLT	MD	MEASURE DOWN
ABDN	ABANDON	MFD	MANUFACTURED
AC	ASBESTOS CONCRETE	MFR	MANUFACTURE, MANUFACTURER
ADDN	ADDITIONAL	MH	MANHOLE
ADJ	ADJACENT	MIN	MINIMUM
AFF	ABOVE FINISHED FLOOR	MISC	MISCELLANEOUS
ALT	ALTERNATE	MJ	MECHANICAL JOINT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	MOV	MOTOR OPERATED VALVE
APPROX	APPROXIMATE	MPWSS	MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS
APVD	APPROVED		
ARCH	ARCHITECTURE, ARCHITECTURAL		
ASPH	ASPHALT	N	NORTH
AVE	AVENUE	NE	NORTHEAST
AVG	AVERAGE	NG	NATURAL GAS
BFV	BUTTERFLY VALVE	NIC	NOT IN CONTRACT
BLDG	BUILDING	NO	NUMBER
BLK	BLOCK	NOM	NOMINAL
BLVD	BOULEVARD	NTS	NOT TO SCALE
BM	BEAM, BENCHMARK	NW	NORTHWEST
BOT	BOTTOM	OC	ON CENTER
BRG	BEARING	OD	OUTSIDE DIAMETER
BRKT	BRACKET	OF	OVERFLOW
BVC	BEGIN VERTICAL CURVE	OH	OVERHEAD
CFC	CLARK FORK COALITION	OHP	OVERHEAD POWER
CHAN	CHANNEL	OHT	OVERHEAD TELEPHONE
CHK	CHECK	OPNG	OPENING
CI	CAST IRON	PC	POINT OF CURVATURE
CIPC	CAST-IN-PLACE CONCRETE	PCC	POINT OF COMPOUND CURVATURE
CIRC	CIRCULAR	PE	PLAIN END, POLYETHYLENE
CJ	CONSTRUCTION JOINT, CONTROL JOINT	PERP	PERPENDICULAR
℄	CENTER LINE	PI	POINT OF INTERSECTION
CLR	CLEAR, CLEARANCE	℗	PROPERTY LINE
CMP	CORRUGATED METAL PIPE	PNL	PANEL
CMU	CONCRETE MASONRY UNITS	PRC	POINT OF REVERSE CURVATURE
CO	CLEANOUT	PREFAB	PREFABRICATED
COL	COLUMN	PRELIM	PRELIMINARY
CONC	CONCRETE	PREP	PREPARE, PREPARATION
CONSTR	CONSTRUCTION	PROP	PROPERTY
CONT	CONTINUE, CONTINUED, CONTINUOUS	PRV	PRESSURE REDUCING VALVE
CONTR	CONTRACTOR	PSF	POUNDS PER SQUARE FOOT
COORD	COORDINATE	PSI	POUNDS PER SQUARE INCH
CP	CONTROL PANEL, CONTROL POINT	PT	POINT, POINT OF TANGENCY
CPLG	COUPLING	PVC	POLYVINYL CHLORIDE
CTR	CENTER	PVI	POINT OF VERTICAL INTERSECTION
CTV	CABLE TELEVISION	PVMT	PAVEMENT
CU	CUBIC, COPPER	R, RAD	RADIUS
CF	CUBIC FEET	RC	REINFORCED CONCRETE
CULV	CULVERT	RCP	REINFORCED CONCRETE PIPE
CY	CUBIC YARD	RD	ROAD
DET	DETAIL	RDCR	REDUCER
DI	DUCTILE IRON, DRAIN INLET	REBAR	REINFORCEMENT BAR
DIA, ⌀	DIAMETER	REF	REFERENCE
DIAG	DIAGONAL	REINF	REINFORCE
DIM	DIMENSION	REQD	REQUIRED
DR	DRIVE	RR	RAILROAD
DWG	DRAWING	RST	REINFORCING STEEL
E	EAST	RT	RIGHT
EA	EACH	R/W	RIGHT-OF-WAY
EL, ELEV	ELEVATION	S	SOUTH, SANITARY SEWER
ELB	ELBOW	SAN	SANITARY
ELEC	ELECTRIC, ELECTRICAL	SCH	SCHEDULE
ENCL	ENCLOSE	SD	STORM DRAIN
ENGR	ENGINEER	SDWK	SIDEWALK
EOP	EDGE OF PAVEMENT	SE	SOUTHEAST
EQ	EQUAL, EQUALLY	SECT	SECTION
EQ SP	EQUALLY SPACED	SF	SQUARE FOOT
EQUIP	EQUIPMENT	SHT	SHEET
EQUIV	EQUIVALENT	SIM	SIMILAR
EVC	END VERTICAL CURVE	SLP	SLOPE
EW	EACH WAY	SPEC	SPECIFICATION
EXC	EXCAVATE	SQ	SQUARE
EXP	EXPANSION	SSTL	STAINLESS STEEL
EXP JT	EXPANSION JOINT	STA	STATION
EXST	EXISTING	SS	SANITARY SEWER SERVICE
FCV	FLOW CONTROL VALVE	STD	STANDARD
FD	FLOOR DRAIN	ST	STREET
FDN	FOUNDATION	STL	STEEL
FES	FLARED END SECTION	STRUCT	STRUCTURE
FET	FLARED END TERMINAL	SW	SOUTHWEST
FF	FINISHED FLOOR	SYM	SYMMETRICAL
FG	FINISH GRADE	TB	THRUST BLOCK
FHYD	FIRE HYDRANT	TBC	TOP BACK OF CURB
FJ	FLANGE JOINT	TBM	TEMPORARY BENCH MARK
FL	FLOW LINE	TEL	TELEPHONE
FLEX	FLEXIBLE	TEMP	TEMPORARY
FM	FORCEMAIN	THRU	THROUGH
FT	FOOT, FEET	TYP	TYPICAL
FO	FIBER OPTIC	UG	UNDERGROUND
FTG	FOOTING, FITTING	UGP	UNDERGROUND POWER
G	NATURAL GAS	UGT	UNDERGROUND TELEPHONE
GA	GAGE, GAUGE	UTIL	UTILITY
GAL	GALLON	V	VALVE, VOLT
GALV	GALVANIZED	VB	VALVE BOX
GND	GROUND	VERT	VERTICAL
GVL	GRAVEL	VOL	VOLUME
HB	HOSE BIB	W	WEST, WATER
HDPE	HIGH DENSITY POLYETHYLENE	WTR	WATER
HOR, HORIZ	HORIZONTAL	WD	WOOD
HWY	HIGHWAY	W/	WITH
HYD	HYDRANT	W/O	WITHOUT
ID	INSIDE DIAMETER	WL	WETLAND
IE	INVERT ELEVATION	WM	WIRE MESH, WATER METER
IN	INCH	WS	WATERSTOP, WATER SURFACE
INV	INVERT	WT	WEIGHT
JB	JUNCTION BOX	WV	WATER VALVE
JT	JOINT	WWF	WELDED WIRE FABRIC
K	RATE OF VERTICAL CURVATURE	WWM	WELDED WIRE MESH
LBS	POUNDS	XFMR	TRANSFORMER
LF	LINEAR FEET	X-ING	CROSSING
LN	LANE	XS	CROSS SECTION
		YD	YARD

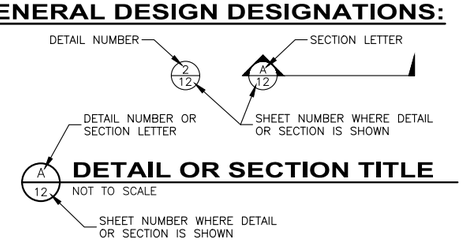
LEGEND

EXISTING	PROPOSED	DESCRIPTION	EXISTING	PROPOSED	DESCRIPTION
		MAJOR CONTOUR			STUMP
		MINOR CONTOUR			SHRUB/BUSH
OHT	OHT	OVERHEAD TELEPHONE			TREE-CONIFER
UGT	UGT	UNDERGROUND TELEPHONE			TREE-DECIDUOUS
CTV	CTV	CABLE TELEVISION			TREE LINE
FO	FO	FIBER OPTIC	Ⓒ	Ⓒ	COMMUNICATION MANHOLE
G	G	NATURAL GAS	C	C	COMMUNICATION VAULT
OHP	OHP	OVERHEAD POWER	T	T	TELEPHONE RISER
UGP	UGP	UNDERGROUND POWER	TV	TV	CABLE TV RISER
S	S	SANITARY SEWER			NATURAL GAS METER
SS	SS	SANITARY SEWER SERVICE	G	G	NATURAL GAS RISER
FM	FM	SANITARY SEWER FORCEMAIN			NATURAL GAS VALVE
SD	SD	STORM DRAIN			LIGHT POLE
		STORM CULVERT			STREET LIGHT POLE
W	W	WATER	P	P	POWER RISER
WS	WS	WATER SERVICE	△	△	TRANSFORMER
		CHAINLINK FENCE	P	P	POWER VAULT
X	X	BARBED WIRE FENCE			UTILITY POLE
		WOOD FENCE			GUY WIRE
		PAVED ROAD	Ⓢ	Ⓢ	SANITARY MANHOLE
		GRAVEL ROAD	CO	CO	SANITARY CLEANOUT
		PROPERTY/LOT LINE			SANITARY LAMPHOLE
		PROPERTY EASEMENT	ST	ST	STORM MANHOLE
		PROPERTY SETBACK			STORM ROUND INLET
		RIGHT-OF-WAY			STORM SQUARE INLET
		CITY LIMIT/DISTRICT BOUNDARY			STORM CATCH BASIN
		RAILROAD			11.25° ELBOW
		DITCH			22.50° ELBOW
		WATER EDGE			45° ELBOW
WL		WETLAND			90° ELBOW
		BUILDING			TEE
		BENCHMARK			CROSS
		CONTROL POINT			CAP
		PROPERTY PIN			FIRE HYDRANT
		BORING			GATE VALVE
		MONITORING WELL			REDUCER
		TEST PIT	W	W	WATER METER
		BOLLARD			WELL
		MAIL BOX			CURB STOP
		SIGN			FROST FREE HYDRANT

GENERAL NOTES:

1. THIS IS A STANDARD LEGEND AND ABBREVIATION LIST. THEREFORE, NOT ALL SYMBOLS AND ABBREVIATIONS MAY BE USED ON THIS PROJECT.
2. EXISTING UNDERGROUND UTILITIES SHOWN ARE FROM THE BEST INFORMATION AVAILABLE. THIS INFORMATION IS APPROXIMATE AND MAY BE INCOMPLETE. FOR ACCURATE LOCATION, THE CONTRACTOR SHALL CONTACT, PRIOR TO EXCAVATION, THE UTILITIES UNDERGROUND LOCATION CENTER AT: 1-800-424-5555.

GENERAL DESIGN DESIGNATIONS:



PROJECT NOTES:

1. THE TOPOGRAPHIC SITE SURVEY WAS CONDUCTED IN SUMMER OF 2018. SITE CONDITIONS MAY HAVE CHANGED SINCE SITE SURVEY. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS. LEGAL/BOUNDARY SURVEY WAS NOT COMPLETED DURING THE SURVEY.
2. A GEOTECHNICAL INVESTIGATION HAS NOT BEEN CONDUCTED AT THE PROJECT SITE. CONTRACTOR TO ANTICIPATE WET, SATURATED SOILS THROUGHOUT AREAS OF THE PROJECT.
3. ALL OWNER FURNISHED ITEMS WILL BE DELIVERED TO THE PROJECT SITE. CONTRACTOR SHALL COORDINATE WITH THE OWNER.
4. EXISTING VEGETATION AT THE PROJECT SITE IS CRITICAL FOR LONG-TERM STABILITY. CONTRACTOR TO UTILIZE CARE TO AVOID DAMAGING TREES, SHRUBS, GRASSES AND OTHER VEGETATION DURING CONSTRUCTION ACTIVITIES (OTHER THAN IDENTIFIED CONSTRUCTION LIMITS AND ANY IDENTIFIED TREE REMOVAL).
5. ANY TRASH, DEBRIS OR OTHER DELETERIOUS MATERIALS SHALL BE HAULED OFF-SITE AND DISPOSED OF PER ALL LOCAL, STATE, AND FEDERAL GUIDELINES. THIS WORK IS INCIDENTAL TO THE PROJECT.
6. CONTRACTOR SHALL DEWATER WORK AREAS (IF SURFACE/GROUNDWATER IS PRESENT) PRIOR TO CONSTRUCTION. CONTRACTOR SHOULD ANTICIPATE WATER INFILTRATING INTO EXCAVATIONS. ALL WORK IN THE CHANNEL AND BELOW ORDINARY HIGH WATER SHALL TAKE PLACE IN ACCORDANCE WITH APPLICABLE PERMITS. METHODS AND MEANS OF DEWATERING TO BE DETERMINED BY THE CONTRACTOR. ALL WORK ASSOCIATED WITH DEWATERING IS INCIDENTAL TO THE APPLICABLE BID ITEM. ANY NECESSARY PERMITTING FOR TEMPORARY TURBIDITY IS THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR SHALL PROVIDE DEWATERING PLAN TO THE OWNER A MINIMUM OF 14 DAYS PRIOR TO DEWATERING ACTIVITIES.
7. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR SITE SAFETY ASSOCIATED WITH THE WORK UNDER THIS PROJECT AND WITH COMPLIANCE WITH ALL FEDERAL, STATE, AND LOCAL HEALTH AND SAFETY LAWS, CODES, REGULATIONS, AND ORDINANCES INCLUDING BUT NOT LIMITED TO THOSE CURRENTLY MANDATED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).

EARTHWORK NOTES:

1. ALL EXCAVATION, TRENCHING, SHORING AND SHIELDING NECESSARY FOR ANY CONSTRUCTION ACTIVITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THESE DRAWINGS ARE NOT INTENDED TO PROVIDE MEANS OR METHODS OF CONSTRUCTION.
2. EXCAVATION VOLUMES SHOWN THROUGHOUT PLANS ARE ESTIMATES AND FOR INFORMATIONAL PURPOSES ONLY. CONTRACTOR TO CONFIRM ACTUAL QUANTITIES FOR BIDDING. NO SHRINK/SWELL FACTORS HAVE BEEN APPLIED.
3. PROPER DRAINAGE SHALL BE MAINTAINED DURING CONSTRUCTION TO KEEP SURFACE RUNOFF (OR FROM SATURATED SOILS) FROM ENTERING THE EXCAVATIONS AND DIRECTED AWAY FROM THE CONSTRUCTION AREA.
4. STRUCTURAL FILL SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF 8" AND COMPACTED TO 95% OF ASTM D698.
5. IF ON-SITE MATERIALS ARE SPECIFIED FOR USE: DRYING, SORTING, AND SCREENING MAY BE NECESSARY.

95% SUBMITTAL - NOT FOR CONSTRUCTION

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1-18266
DESIGNED: RME
DRAWN: RME
CHECKED: JRW
APPROVED: RME
DATE: MAY 29, 2019

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HELENA, MT 59601
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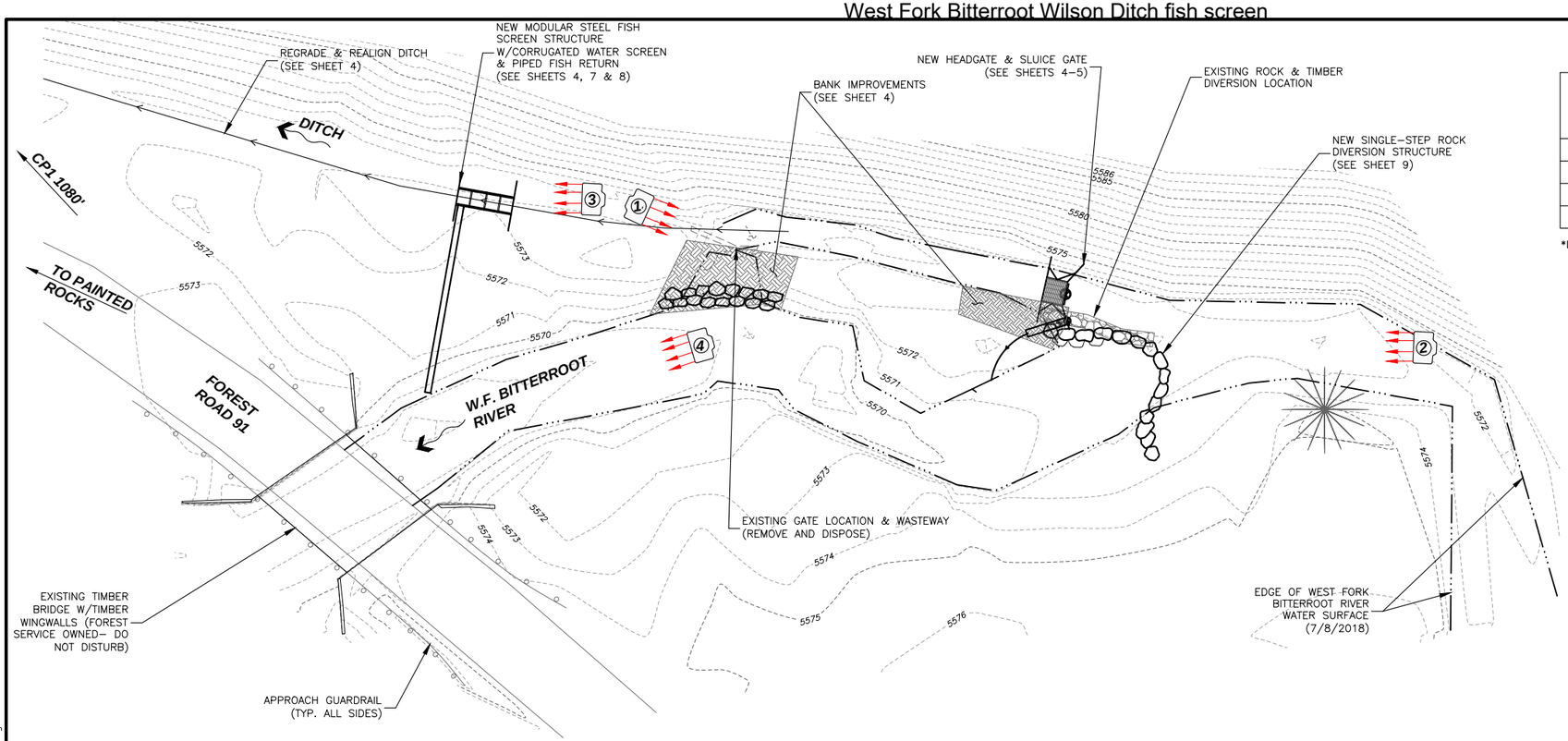
TROUT UNLIMITED
WEST FORK BITTERROOT
DIVERSION & FISH SCREEN
LEGEND & GENERAL NOTES

SHEET NO.
2
OF 9

F:\1-18266-TU Bitterroot Fish Screen & Diversion Designs\CADD 1-18266-West Fork\Sheets\1-18266-WestFork-02-LegendGeneralNotes.dwg

West Fork Bitterroot Wilson Ditch fish screen



OVERALL SITE PLAN & CONTROL DIAGRAM

0 10 20
SCALE IN FEET

HERON

CONTROL POINT COORDINATE TABLE

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP1	503,759.67	735,080.64	5548.22	REBAR W/CAP
CP2	502,553.93	734,473.39	5576.53	REBAR W/CAP
CP3	502,316.29	734,123.70	5590.29	REBAR W/CAP

*LOCAL COORDINATE SYSTEM UTILIZED

SITE PHOTO 1: LOOKING AT EXISTING HEADGATE

SITE PHOTO 2: LOOKING AT EXISTING DIVERSION STRUCTURE

SITE PHOTO 3: LOOKING DOWNSTREAM IN DITCH

SITE PHOTO 4: LOOKING DOWNSTREAM ON CHANNEL TOWARDS BRIDGE

95% SUBMITTAL - NOT FOR CONSTRUCTION

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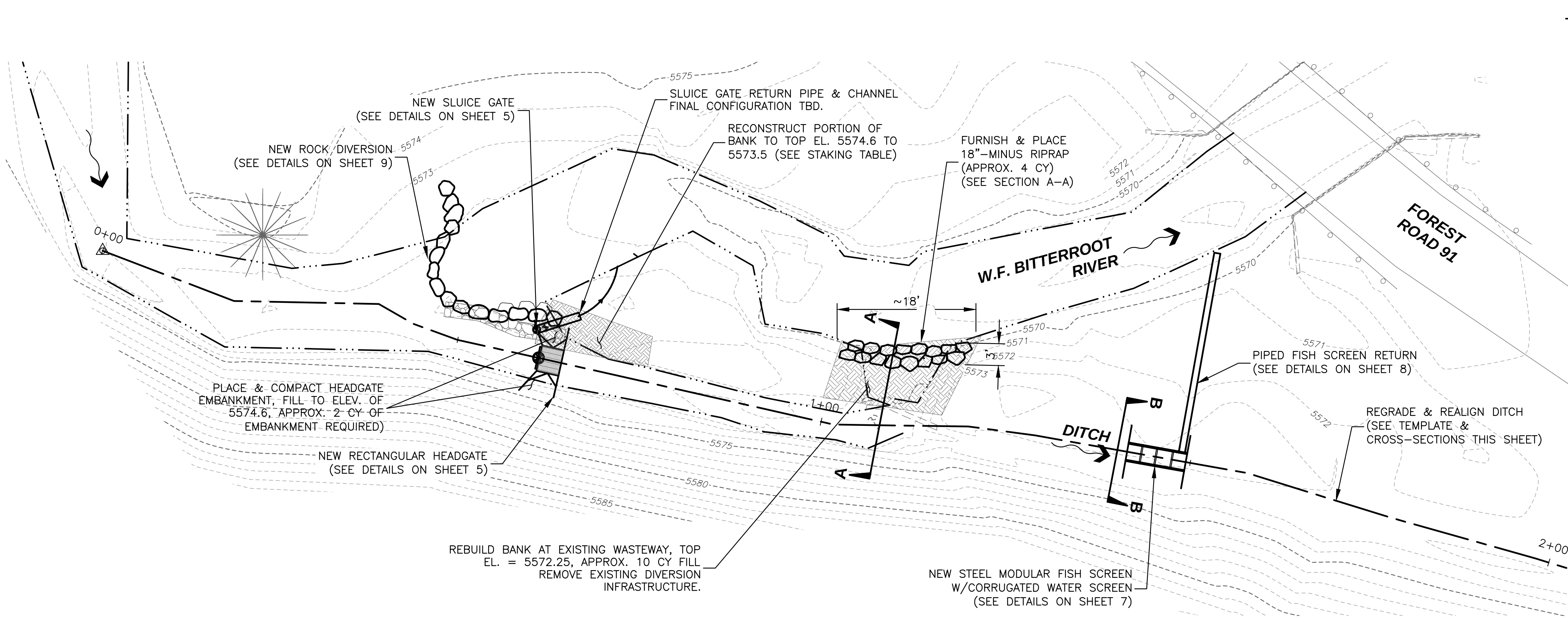
TROUT UNLIMITED
WEST FORK BITTERROOT DIVERSION & FISH SCREEN
OVERALL SITE PLAN & CONTROL DIAGRAM

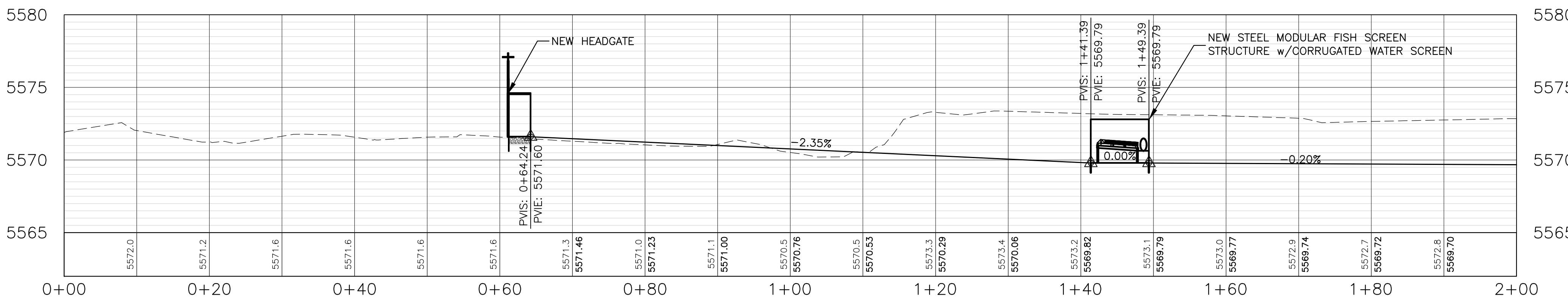
SHEET NO.
3
OF 9

F:\1-18266-TU Bitterroot Fish Screen & Diversion Designs\CADD 1-18266-West Fork\Sheets\1-18266-WestFork-03-SitePlan.dwg



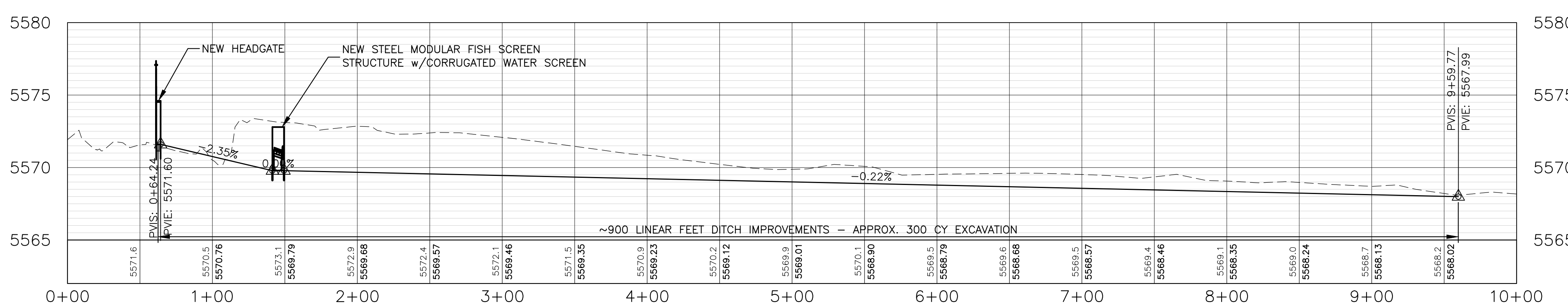
PLAN VIEW OF DITCH, HEADGATE & FISH SCREEN - STA. 0+00 TO STA. 2+00

0 10 20
SCALE IN FEET



PROFILE VIEW OF DITCH, HEADGATE & FISH SCREEN - STA. 0+00 TO STA. 2+00

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 10'



PROFILE VIEW OF ENTIRE DITCH REGRADING - STA. 0+00 TO STA. 10+00

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

STAKING TABLE

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION

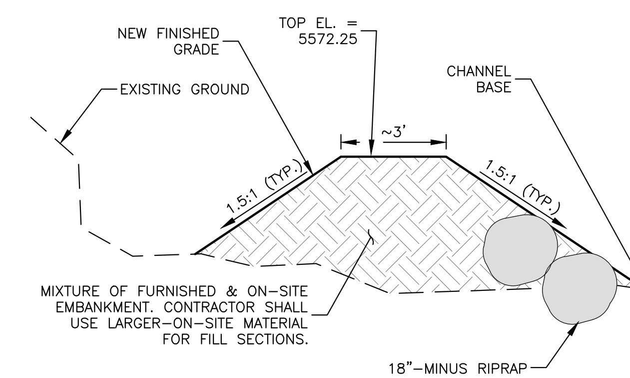
TBD AT FINAL

NOTES:

1. IMPORTED EMBANKMENT MATERIAL SHALL MEET THE FOLLOWING GRADATION AND BE FREE OF NOXIOUS WEEDS, BOULDERS, STICKS AND OTHER DELETERIOUS MATERIALS:

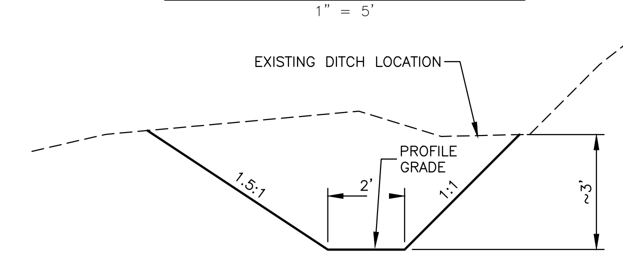
EMBANKMENT GRADATION

SIEVE OPENING	PERCENT PASSING
6-INCH	100
2-INCH	30-50
NO. 4	0-10



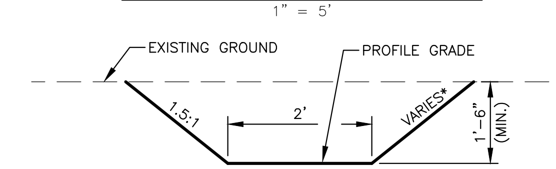
SECTION A-A - BANK

1" = 5'



SECTION B-B DITCH

1" = 5'



TYP. DITCH SECTION

NOT TO SCALE *MATCH HILL SLOPE

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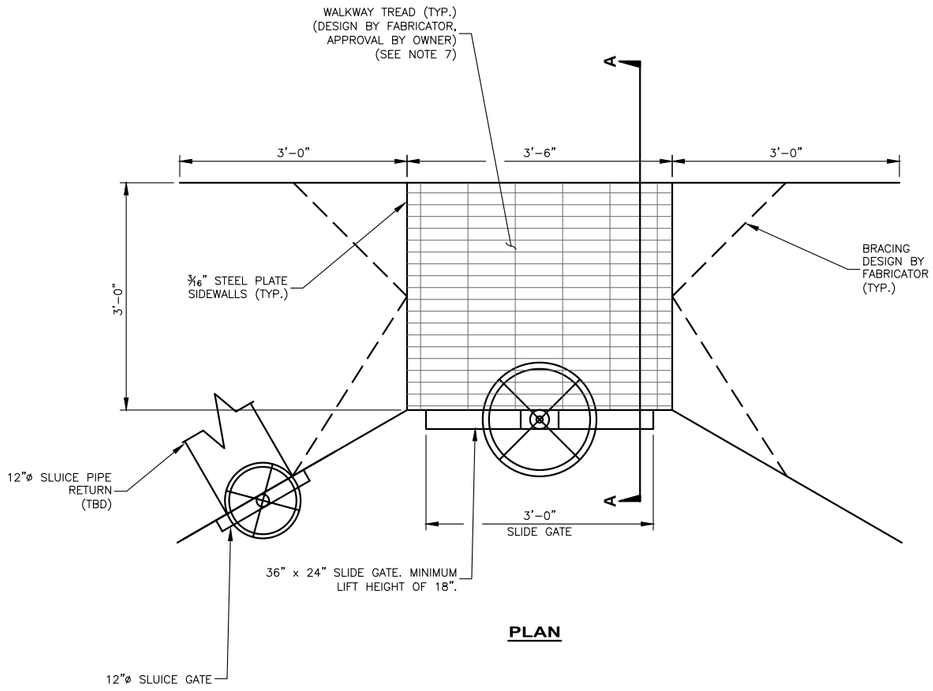
TROUT UNLIMITED
WEST FORK BITTERROOT DIVERSION & FISH SCREEN

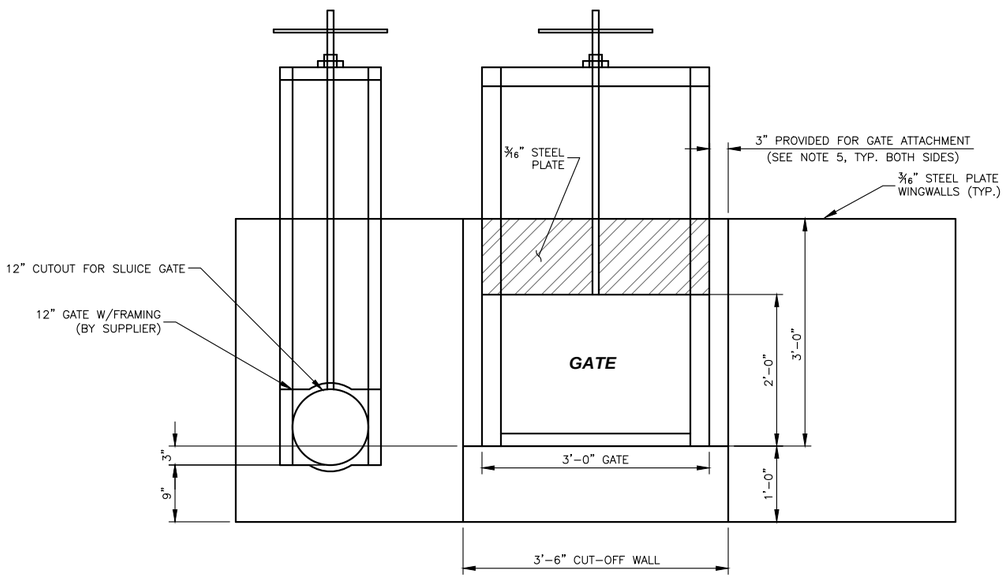
NEW DITCH, HEADGATE AND FISH SCREEN PLAN & PROFILE



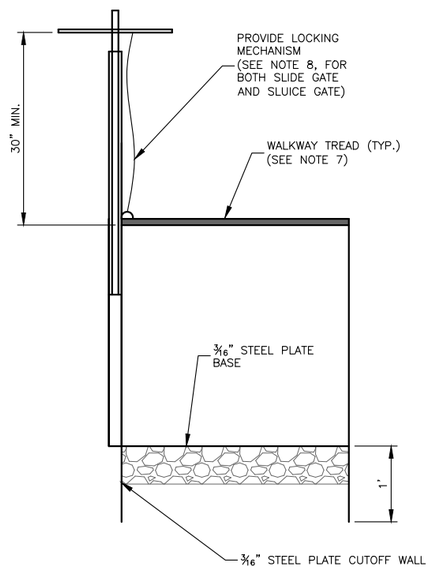
PLAN

ELEVATION VIEW OF SIMILAR HEADGATE STRUCTURE

ELEVATION VIEW OF SIMILAR HEADGATE STRUCTURE



ELEVATION



SECTION A-A

HEADGATE & SLUICE GATE DETAILS

SCALE: 3/8" = 1'–0"

HEADGATE NOTES:

1. ALL PLATE STEEL SHALL BE 3/16" THICK, A36.
2. TO ALLOW EASE OF TRANSPORT TO THE SITE, THE WINGWALLS SHALL BE SEPARATE MEMBERS TO ALLOW BOLTED OR WELDED CONFIGURATION TO HEADGATE BOX. BOLTING CONFIGURATION AND PATTERN TO BE DESIGNED BY FABRICATOR. WELDING CONFIGURATION TO BE DESIGNED BY FABRICATOR. IF FIELD WELDED, PAINT ALL WELDED AREAS AFTER COMPLETION OF WELDING ACTIVITIES.
3. FINISH GRADE ELEVATIONS SHOWN ON SHEET 4.
4. NEW HEADGATE AND SLUICE GATE SHALL BE CONNECTED PER THE MANUFACTURER'S RECOMMENDATIONS. GATES SHALL BE PAINTED TO RESIST CORROSION. THE HANDWHEEL FOR BOTH GATES SHALL EXTEND A MINIMUM OF 30" AND MAXIMUM OF 36" ABOVE THE TOP OF THE WALKWAY TREAD/TOP WALL.
5. GATE ATTACHMENT DIMENSION MAY VARY. DEPENDENT ON FABRICATOR AND HEADGATE SUPPLIER.
6. FABRICATOR TO PROVIDE SHOP DRAWINGS TO THE OWNER FOR REVIEW PRIOR TO FABRICATION.
7. WALKWAY TREAD SHALL BE DESIGNED FOR A MINIMUM TOTAL LOADING OF 500 POUNDS.
8. A CHAIN AND LOCKING MECHANISM SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR TO ALLOW LOCKING OF THE HANDWHEEL/STEM TO THE STRUCTURE.
9. ALL BRACING AND CONNECTIONS TO BE DESIGNED BY FABRICATOR.

95% SUBMITTAL - NOT FOR CONSTRUCTION

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DESIGNED: RME
DRAWN: RME
CHECKED: JRW
APPROVED: RME
DATE: MAY 29, 2019

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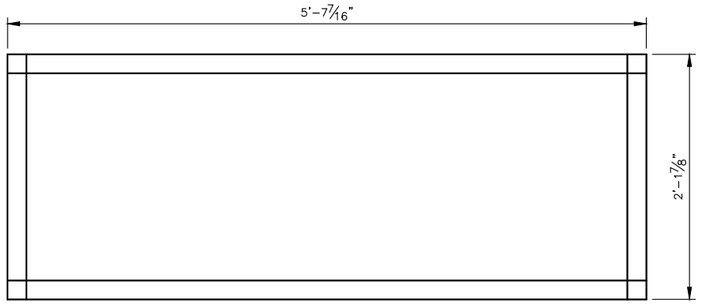
HELENA, MT 59601
(406)449-8627

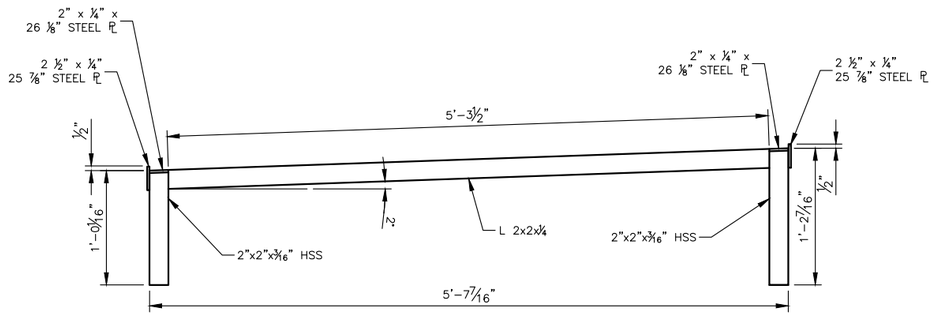
TROUT UNLIMITED
WEST FORK BITTERROOT DIVERSION & FISH SCREEN
HEADGATE DETAILS

SHEET NO.
5
OF 9



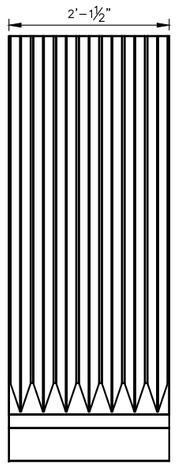
INTERNAL FRAME - PLAN VIEW - TOP

SCALE: 3/4" = 1'-0"



INTERNAL FRAME - PROFILE VIEW

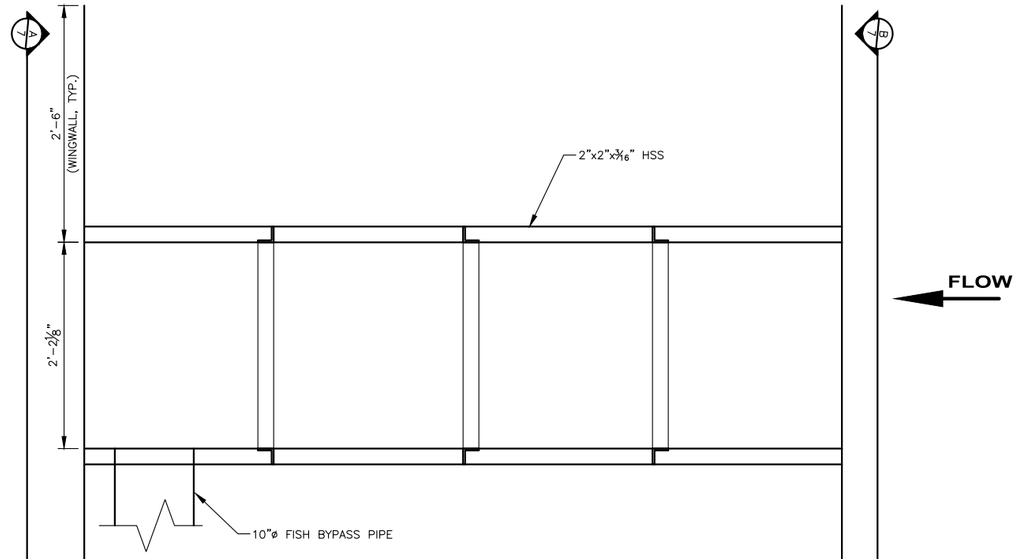
SCALE: 3/4" = 1'-0"



SCREEN PANEL - TOP SIDE

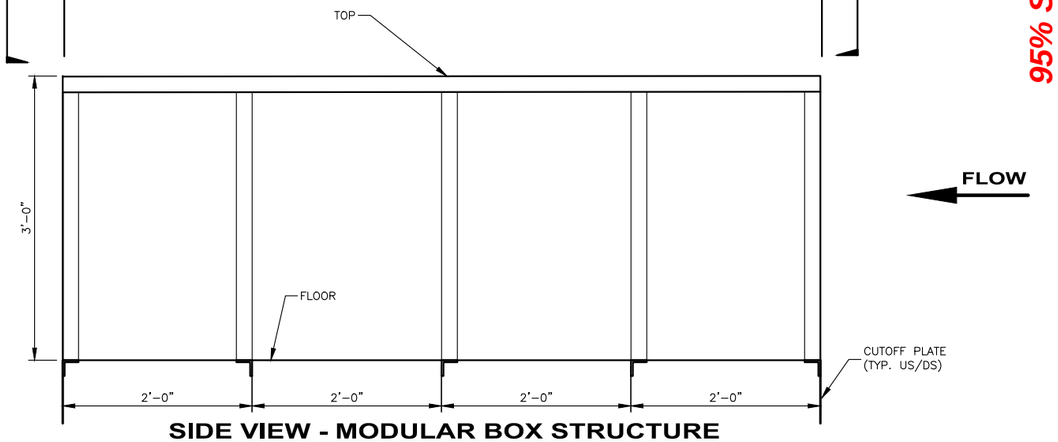
NO SCALE

VIEW OF TOP SCREEN SURFACE (COURTESY OF BRENT MEFFORD)



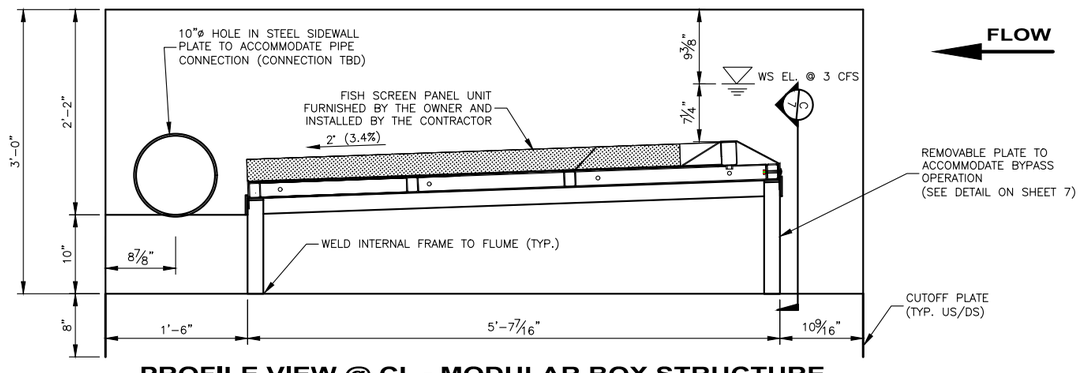
PLAN VIEW - MODULAR BOX STRUCTURE

SCALE: 5/8" = 1'-0" **FRAME NOT SHOWN**



SIDE VIEW - MODULAR BOX STRUCTURE

SCALE: 5/8" = 1'-0" **FRAME NOT SHOWN**



PROFILE VIEW @ CL - MODULAR BOX STRUCTURE

SCALE: 5/8" = 1'-0"

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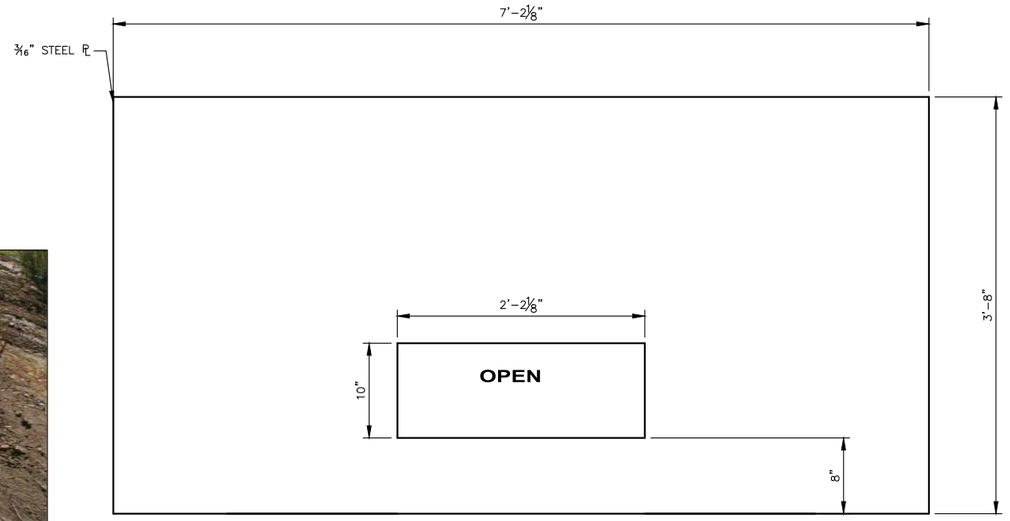
WEST FORK BITTERROOT DIVERSION & FISH SCREEN
FISH SCREEN DETAILS

SHEET NO.
6
OF 9

NOTES:

1. OWNER WILL FURNISH (1) 2'–1 ½" WIDE CORRUGATED STAINLESS STEEL SCREEN PANEL WITH SUPPORT ANGLES FOR THE CONTRACTOR TO INSTALL PER THE MANUFACTURER'S RECOMMENDATIONS. CORRUGATED SCREEN PANELS ARE 16 GAGE, STAINLESS STEEL PERFORATED PLATE W/ 3/32" DIAMETER HOLES WITH A 40 PERCENT OPEN AREA.
2. THE CONTRACTOR SHALL FURNISH AND INSTALL THE REMAINDER OF THE STRUCTURE, APPURTENANCES AND ATTACHMENTS SHOWN ON THE DRAWINGS.
3. ALL PLATE STEEL SHALL BE 3/16" THICK, A36. COATING TBD.
4. FINISH GRADE ELEVATIONS SHOWN ON SHEET 4.
5. FABRICATOR TO PROVIDE SHOP DRAWINGS TO THE OWNER FOR REVIEW PRIOR TO FABRICATION.

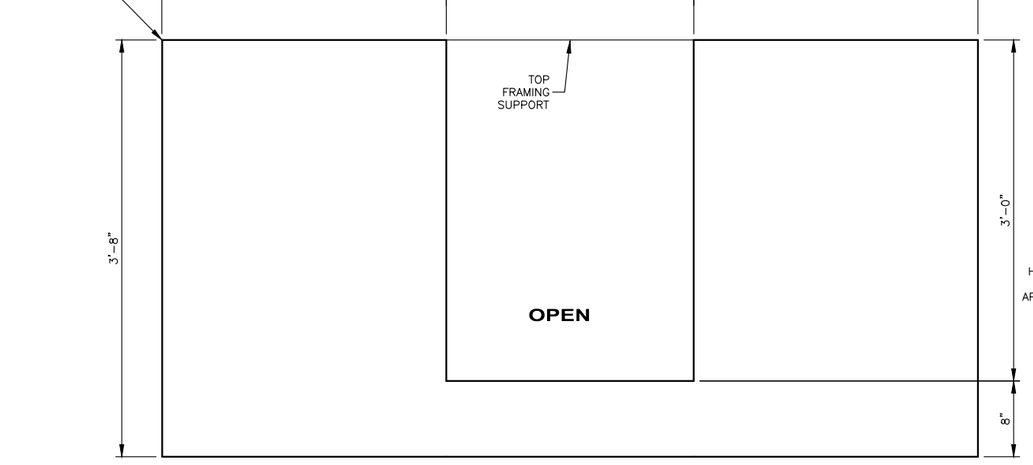
EXAMPLE PHOTO
(CORRUGATED WATER SCREEN)



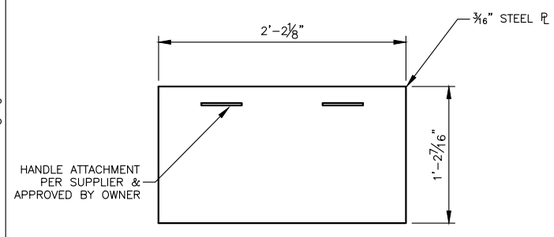
A/7 **END PLATE - DOWNSTREAM**
SCALE: 3/4"= 1'–0"

ATTACHMENT TBD

C/7 **BYPASS - FRONT VIEW**
SCALE: 3/4"= 1'–0"



B/7 **END PLATE - UPSTREAM**
SCALE: 3/4"= 1'–0"



APPROX. WEIGHT - 20 LBS

D/7 **BYPASS PLATE DETAIL**
SCALE: 3/4"= 1'–0"

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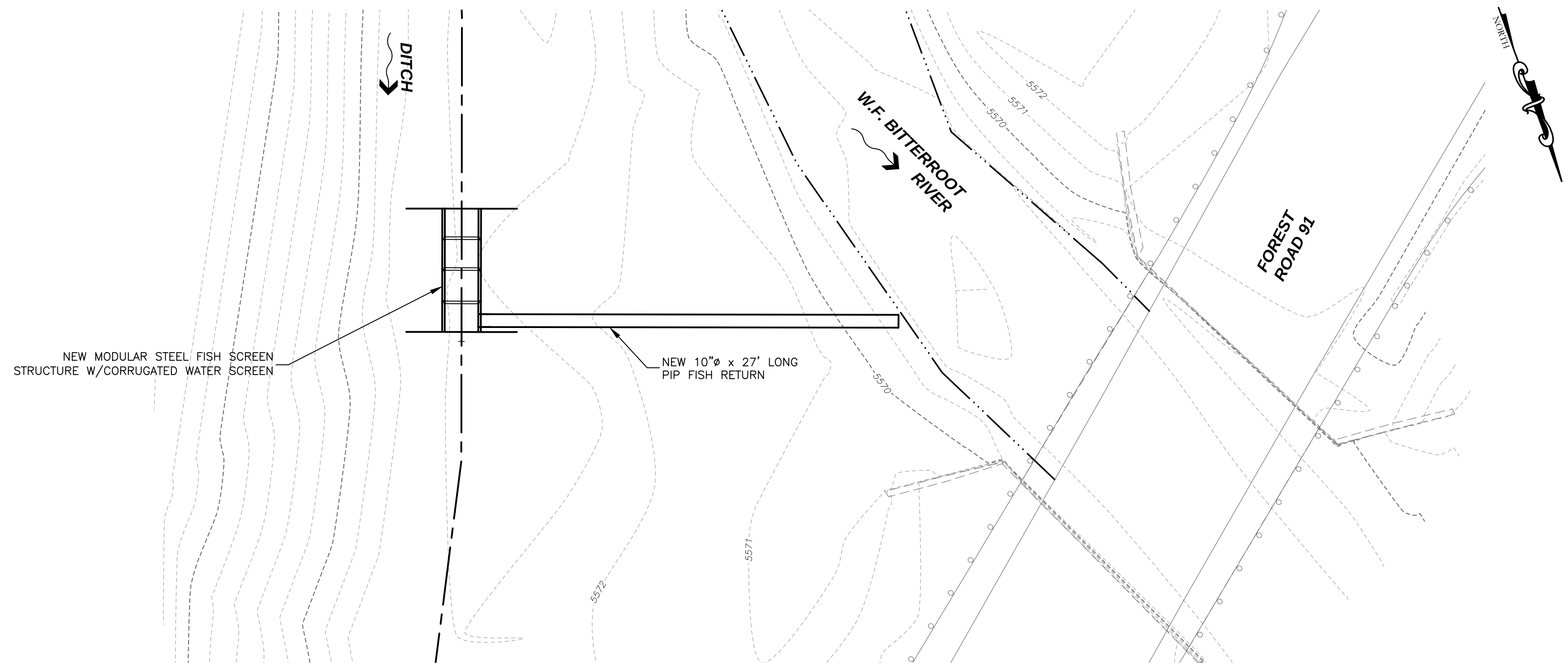
TROUT UNLIMITED
WEST FORK BITTERROOT DIVERSION & FISH SCREEN
FISH SCREEN DETAILS

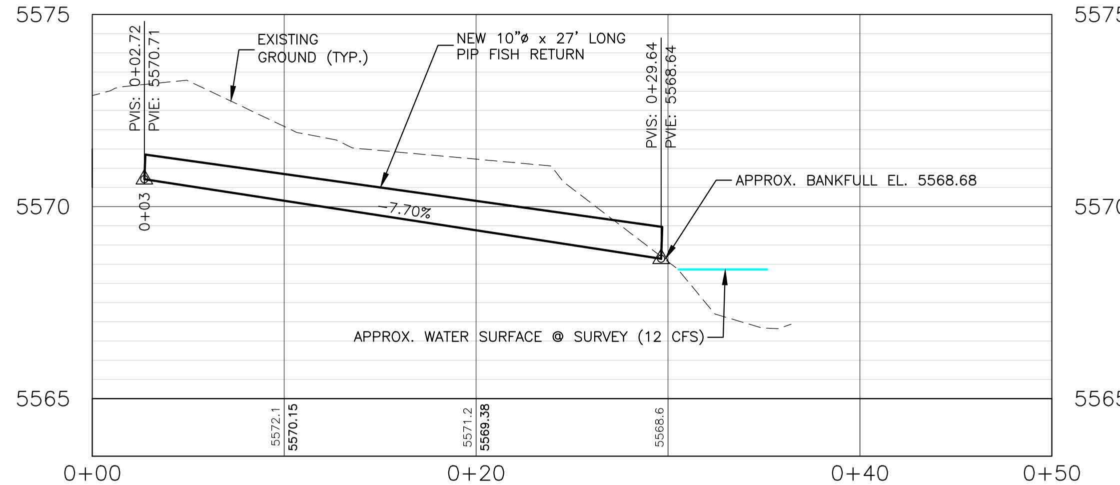
SHEET NO.
7
OF 9

F:\1-18266-TU Bitterroot Fish Screen & Diversion Designs\CADD 1-18266-West Fork\Sheets\1-18266-WestFork-07-ScreenDetails.dwg



PLAN VIEW OF FISH RETURN - STA. 0+00 TO STA. 0+50

0 5 10
SCALE IN FEET



PROFILE VIEW OF FISH RETURN - STA. 0+00 TO STA. 0+50

HORIZONTAL SCALE: 1" = 10'
VERTICAL SCALE: 1" = 5'

APPROX. FISH SCREEN RETURN LOCATION

TREE/STUMP REMOVAL MAY BE REQUIRED

FISH SCREEN RETURN LOCATION

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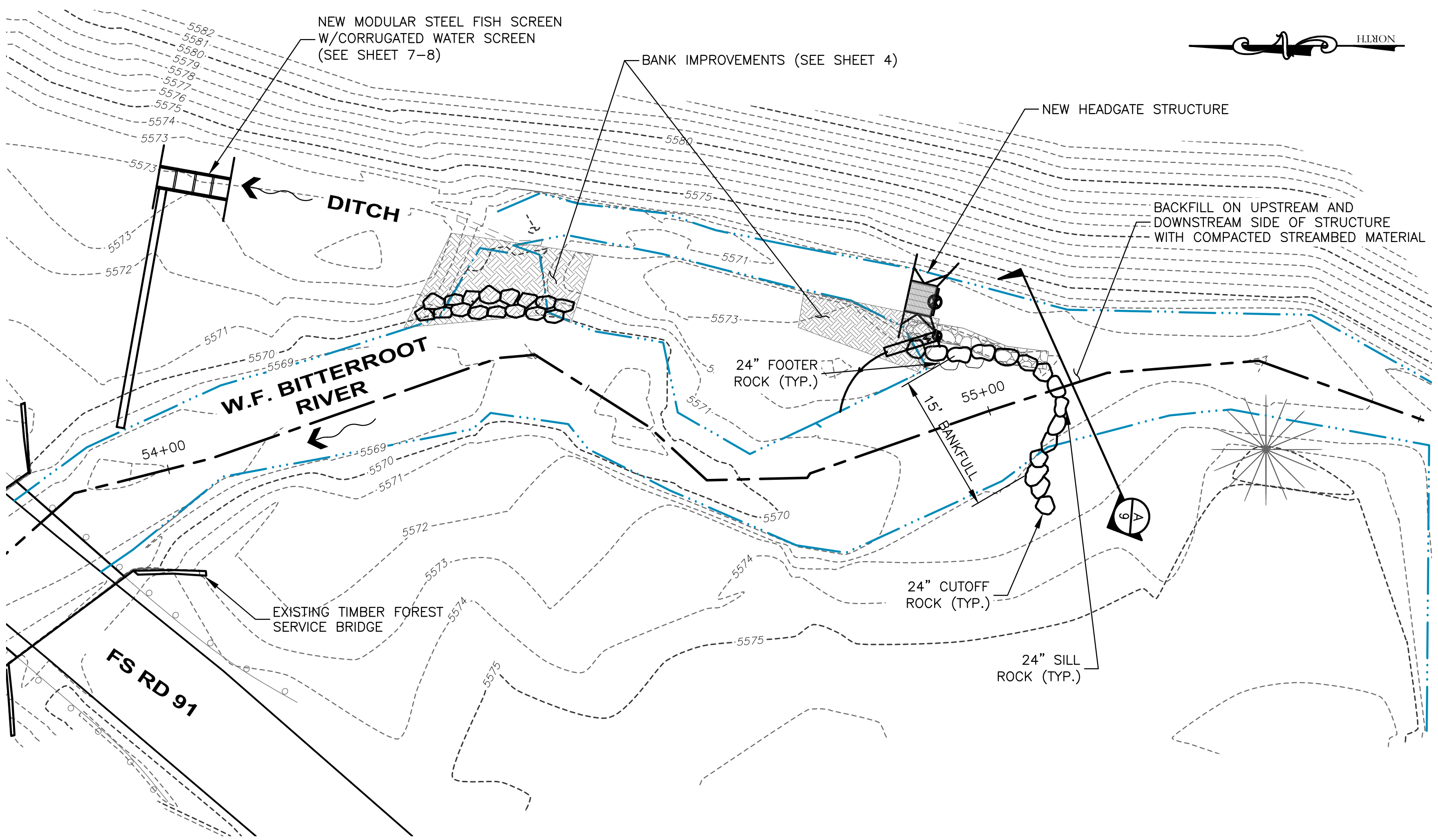
TROUT UNLIMITED
WEST FORK BITTERROOT DIVERSION & FISH SCREEN
FISH RETURN PIPE PLAN & PROFILE

SHEET NO.
8
OF 9

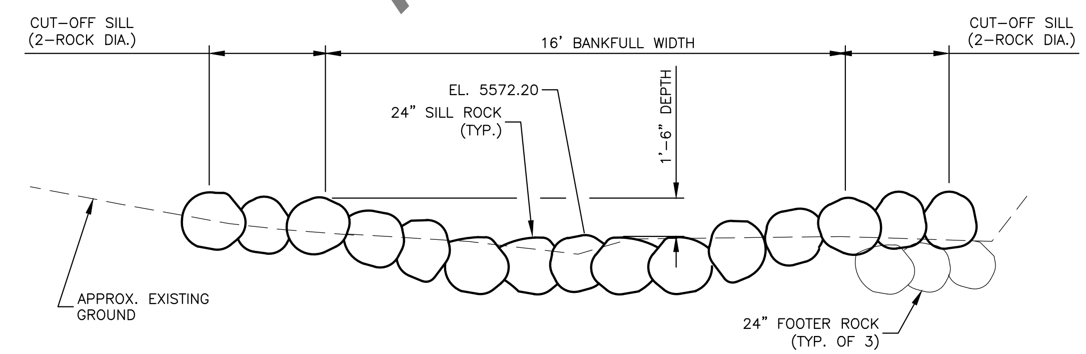


PLAN VIEW OF WEST FORK BITTERROOT RIVER - STA. 54+00 TO STA. 55+50

0 10 20
SCALE IN FEET

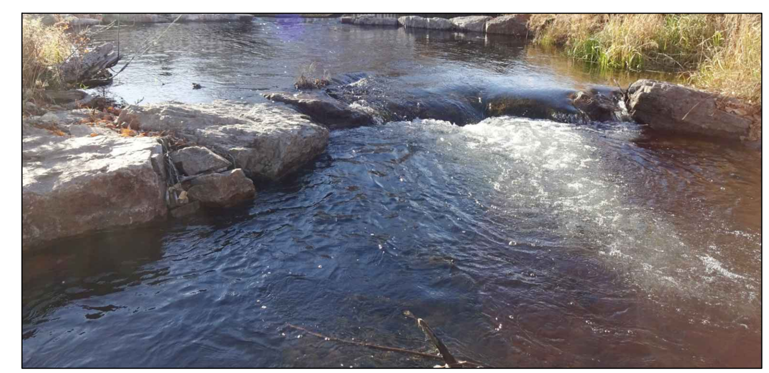
STAKING TABLE				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION

TBD AT FINAL



A/9 ROCK CROSS-VANE ELEVATION

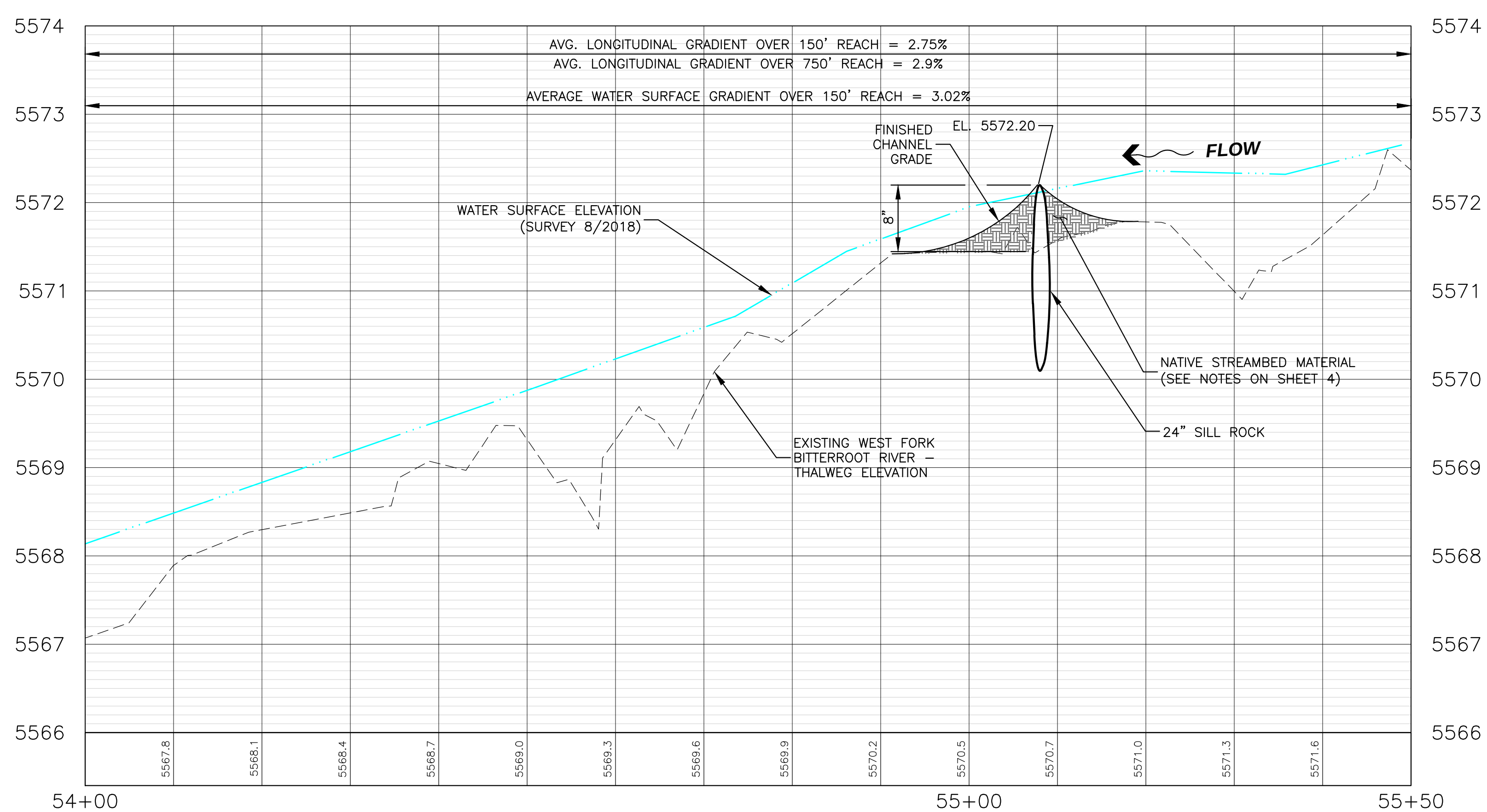
SCALE: 1/8"= 1'–0"



SIMILAR ROCK CROSS-VANE

CROSS-VANE STRUCTURE NOTES:

1. ALL CROSS VANES: PLACE SILL ROCKS TIGHTLY TOGETHER, AS SHOWN ACROSS THE LENGTH OF THE STRUCTURE.
2. AVERAGE ROCK FOR THE STRUCTURES SHALL BE 24". MINIMUM B–AXIS OF ROCKS SHALL BE 18".



PROFILE VIEW OF WEST FORK BITTERROOT RIVER - STA. 54+00 TO STA. 55+50

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

95% SUBMITTAL - NOT FOR CONSTRUCTION

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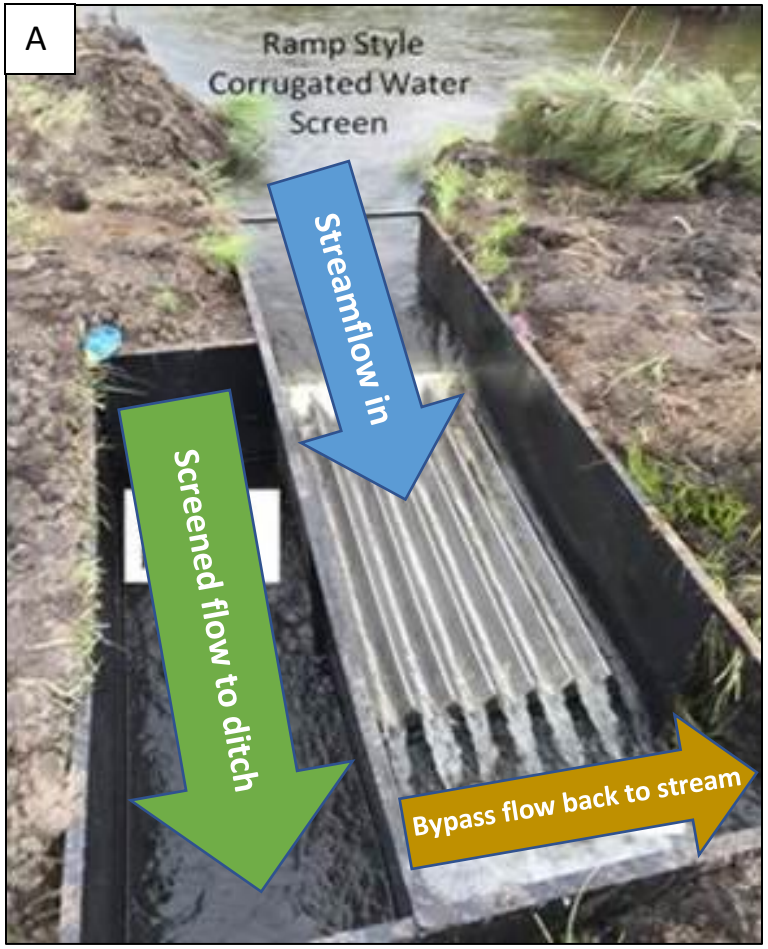
TROUT UNLIMITED
WEST FORK BITTERROOT DIVERSION & FISH SCREEN
DIVERSION PLAN, PROFILE & DETAILS

SHEET NO.
9
OF 9

F:\1-18266-TU Bitterroot Fish Screen & Diversion Designs\CADD 1-18266-West Fork\Sheets\1-18266-WestFork-09-StreamPP.dwg

West Fork Bitterroot Wilson Ditch fish screen



A. The corrugated water screen will be placed in the ditch. Stream water flows over the perforated screen, with the majority of water falling through the screen vertically and continuing into the ditch. A portion of water flows across the top of the screen carrying fish and debris into a 12'' buried bypass pipe that returns to the creek.

B. Fish and debris travel along the stainless steel fish trough, into a bypass pipe, and back to the stream. Lab studies have shown no bruising, descaling or injury to screened fish.

DRAFT agreement between Trout Unlimited and Wilson Ditch water users, outlining roles and responsibilities for implementation and maintenance. Language is subject to change depending on funding sources and ongoing negotiations.

RESTORATION PROJECT AGREEMENT
for
Wilson Ditch Diversion Improvement and Fish Screen Project

This Agreement between Trout Unlimited (TU), and _____(Water Users) is entered into to authorize natural resource restoration and improvements (Work) to irrigation diversion infrastructure owned and maintained by the Water User on West Fork Bitterroot River. The restoration project site is located in the __1/4 of the ___1/4 of Section T__R with property owned by Bitterroot National Forest.

1. Project Description. The Work to be performed for these projects is defined in the attached Scope of Work (Attachment A).

2. Coordination of Work. TU shall coordinate the Work on the diversion infrastructure, including permitting, contracting and construction, with the Water Users and Landowners in partnership.

3. Funding. TU shall provide ____Water users shall provide $7,500 (in kind and cash)___

4. Term of Agreement. The term of this Agreement is twenty (20) years.

5. Water User's Responsibilities. The restoration project is intended to provide long-term improvement to natural resources in the West Fork Bitterroot watershed. Therefore, the Water User agrees to operate and maintain the infrastructure installed with the project according to the Project Operation and Maintenance Plan (Attachment B) for a minimum of 20 years following mutual execution of this Agreement.

6. Binding Effect. The provisions of this Agreement are binding on the heirs, personal representatives, administrators, and successors of the parties to the same extent as on the original parties, except as otherwise provided by mutual written consent.

7. Reasonable Access. Water Users shall allow Trout Unlimited and Bitterroot National Forest agents access to the infrastructure as necessary for: (1) construction of the projects defined in the Scope of Work (Attachment A-1); (2) performance of the maintenance practices specified in the Operation and Maintenance Plan (Attachment B); and (3) to inspect project improvements to ensure the goals of all projects are being met, including

monitoring, evaluating ongoing operation and maintenance, and determining project effectiveness over time.

8. Modification of Agreement. This Agreement, including the Operation and Maintenance Plan (Attachment B), may be modified through a written modification to this Agreement that is approved by all parties to this Agreement.

9. Ownership of Real Property. Water User guarantees ownership of the above-described infrastructure and warrants that, to its best knowledge, there are no outstanding rights that will interfere with this Agreement. Water User shall promptly notify Trout Unlimited if the associated water rights are sold or transferred during the Term of this Agreement. In addition, Water User agrees to coordinate contact between the subsequent owner or their agent and Trout Unlimited for the purpose of discussing potential future management plans.

10. Notice. Any notice given under this Agreement must be in writing and served to all parties of this Agreement by registered or certified mail, return receipt requested and sent to the parties' addresses as set forth below. A party wishing to change its designated address must do so in a writing sent to all parties of this Agreement. Notice served under this provision shall be complete when deposited in the United States mail. Refusal to accept or failure of delivery because of a changed address for which no change-in-address was given shall be considered receipt of notice.

Trout Unlimited liaison and address:

Christine Brissette
Trout Unlimited
312 N. Higgins Ave, Suite 500
Missoula, MT 59802

Water User liaison and address:

_____
_____

11. Termination of Agreement. Any party may terminate this Agreement for failure of the other party to perform any of the services, duties, or conditions contained in this Agreement after giving thirty (30) days written notice to the other parties.

12. No Assumption of Jurisdiction. Trout Unlimited do not assume jurisdiction over any property as a result of this Agreement. Nothing in this Agreement conveys title, possessory interest, or any other property right associated with the Water User's property.

IN WITNESS WHEREOF, the parties have caused this Agreement to be duly executed intending to be bound thereby, effective as of the latest date below.

BY: _____ _____
Trout Unlimited Date

BY: _____ _____
Water Users Date

Attachment A-1

Scope of Work

Wilson Ditch Diversion Improvement and Fish Screen Project

PURPOSE

The purpose of this project is to reduce fish entrainment by installing a fish screen and improving the Wilson diversion on West Fork Bitterroot River, above Painted Rocks Reservoir.

BACKGROUND

Trout Unlimited (TU) conducted fish passage and entrainment assessment and prioritization of upper Bitterroot River diversion structures during the 2017 field season. Since then, TU has coordinated with Fish Wildlife and Parks (FWP) and Bitterroot National Forest (BNF) to develop fish passage project priorities in this region, with the goal of reconnecting priority bull trout streams. The Wilson Ditch, located on BNF land, was identified as a high priority for screening due to its high location in the watershed and proximity to native trout spawning reaches. In 2018, TU contracted with River Design Group and Great West Engineering to survey and design fish screens for the Wilson Diversion.

TASKS

TU will hire Enhanced Forest Management Inc. to complete the scope of work, with oversight by Trout Unlimited. Enhanced Forest Management owner, Dyrk Kreuger, is a close relative of the water users and will provide these services at reduced rates as part of the family's in-kind contribution.

Task 1 – Replace Diversion Dam and Headgate

The Contractor will replace the existing diversion dam and install a rock weir that allows year-round fish passage, provides bedload transport through the structure, and delivers irrigation water for the existing capacity of the Wilson Ditch. West Fork Bitterroot River will be diverted around the project site, as required by permitting, during construction of the new diversion. A new headgate will be installed to control flow into the ditch.

Task 2 – Install Fish Screen

The Contractor will install a corrugated water screen, furnished by TU.

SCHEDULE

TU will coordinate construction schedule with landowners, water users, and contractors. Construction is projected to take approximately 1 week to complete. Construction will be coordinated with water users to not interfere with irrigation water delivery during construction.

Attachment A-2
Project Plans

Attachment B
Operation and Maintenance Plan

Goals: The project is intended to ensure efficient delivery of irrigation water and minimize maintenance for water users while protecting and enhancing the West Fork Bitterroot fishery by operation and maintenance of a fish screen and fish-friendly irrigation diversion system. The fish screen will prevent West Fork Bitterroot River fish from becoming entrained into the irrigation system and the diversion will allow for upstream fish passage while providing delivery and control of irrigation water.

Fish Screen and Diversion Operation and Maintenance:

The Water Users will be responsible for operation and maintenance of the diversion and headgate. Trout Unlimited will assist the Water Users to coordinate optimal performance of the fish screen along with operation of the diversion and headgate for water delivery.

The diversion and fish screen are designed to function and deliver irrigation water through the typical range of seasonal conditions on the upper West Fork Bitterroot River and irrigation demand. Water users agree to maintain and use the fish screen during normal circumstances. Fish screen panels are designed to be removable in the event of a mechanical failure, extreme flow event or during any other conditions that might prevent the screen from delivering full legal irrigation water demand down ditch. All parties agree that Water Users may *temporarily* lift screen panels as necessary to deliver water in the event that legal flow is impaired. In this case, the water user will notify TU within 24-hours. All parties agree that water users may remove screen panels during any period that TU or a contractor is unable to repair or adjust the screen to perform as designed.

Recurring maintenance will include, but is not limited to the following:

1. Water Users. The Water Users will be responsible for day to day operation of the diversion and headgate. The Water User can expect some seasonal variation in the frequency of operation and maintenance tasks at the headgate and screen necessary for optimal function of the irrigation system and fish screen.

As necessary:

- Clean any accumulated debris from trash rack and headgate.
- Adjust headgate as necessary to maintain bypass flow and irrigation flow through screen.
- Clean debris from screen
- Contact Trout Unlimited if screen is not functioning as designed, i.e. debris accumulation on the screen or problems delivering full legal irrigation demand.

Annually:

- Inspect headgate for function and perform maintenance as necessary.
- Close headgate and coordinate winterizing the screen system after irrigation season with Trout Unlimited.

2. Trout Unlimited. Trout Unlimited and/or a contractor will perform the following operation and maintenance tasks:

As necessary:

- Respond to notification from water users to address unscheduled screen maintenance needs.

Annually:

- Inspect the screen for function and repair as necessary.

Wilson Ditch Fish Screen

Corrugated Water Screens

In Fall 2018, The Clark Fork Coalition (CFC) and Trout Unlimited (TU) presented two projects to the Future Fisheries review committee that proposed using a Corrugated Water Screen (CW Screen) to screen priority ditches in the Bitterroot basin. One proposal was rejected, and one recommended for funding, but later cut due to budget limitations.

During the review, the committee expressed concerns with funding CW screens, a fish screen that is not yet approved by NOAA's National Marine Fisheries Service (NMFS). The concern was primarily for projects that are targeting large fish that may have more difficulty passing over a screen, or ESA-listed species.

Since that meeting, CFC and TU have done a great deal more research on these screens and have discussed them at length with engineers, project managers using CW Screens in other states, and agency partners. Based on these conversations, we still believe that this technology is one of the most promising on the market today and worth Future Fisheries' investment. Below, we've outlined our rational for selecting this screen design.

A CW Screen being installed by Trout Unlimited on the South Fork Chalk Creek, Utah

1. CW Screens were designed by Brent Mefford, a retired engineer who spent over 30 years testing fish screen designs at BOR's lab in Colorado. The CW Screens, while not yet NMFS approved, are designed to meet NMFS criteria, limiting potential impacts to fish of all sizes. This is similar to the Coanda screen which is also not NMFS approved, but has a proven track record in Montana. NMFS criteria include approach velocities, sweeping velocities, screen face material, bypass design and operations/maintenance (cleaning mechanisms).
2. CW screens have been tested on juvenile and young of year (30-55mm) fish with no indication of injury or delayed mortality.
3. While CW screens have not been rigorously tested on live, adult fish, hydraulic analyses and initial testing indicate that adult fish would pass over the screen within 2 seconds, without risk of injury or impingement (sweeping velocities > downward velocities). New data from the USFW shows over 100 endangered fish (suckers and chubs) exceeding 400mm have been successfully saved from entrainment by the 60 cfs screen in Green River, Utah in the last several weeks.
4. George Jordan and the US Fish and Wildlife Service support these screens being used to protect ESA-listed species and are contributing $90,000 to the Lolo Ditch project. CW screens are currently being used in other states to protect ESA-listed fish, including the Green River, UT (razorback sucker, bonytail chub and Colorado pike minnow).
5. TU and CFC have called project managers and even visited several of these installations in other states (see attached summary from Green River, UT). These projects are all performing as designed.

6. CW screens are substantially cheaper than other screens on the market. In both projects proposed in fall 2018, the second ranking alternative was a Farmers Conservation Alliance Screen. For TU this would have meant a project cost increase of $26,000 and for CFC an additional $85,000.

Our organizations appreciate the questions posed by the Future Fisheries committee. Certainly, projects of this investment level require scrutiny and a critical eye. We hope that you will trust that our groups, through thorough conversations with engineers, USFWS, Montana FWP biologists, USFS biologists and partners from successful projects in other states, have done our due diligence in selecting these screens as the best alternative for our projects. Fish screens are inherently difficult to fund, and we will need Future Fisheries support. We believe this technology provides an otherwise unprecedented combination of cost savings and effectiveness that will help us do more with less, and collectively reduce native fish entrainment.

Thank you for your consideration,

Christine Brissette

Christine Brissette

Trout Unlimited

Jed Whiteley

Clark Fork Coalition

Link to South Fork Chalk Creek CW Screen video (2-5 cfs):
https://www.youtube.com/watch?v=vn5kDD9KAzg&feature=youtube

See attachment for Green River CW Screen summary (60cfs)

22 April, 2019

TO: Michele McGree, Montana Fish Wildlife and Parks
FROM: Will McDowell and Jed Whiteley, Clark Fork Coalition

RE: TRIP REPORT ON VISIT TO GREEN RIVER CANAL FISH SCREEN, UTAH

On April 15-17 Jed Whiteley and Will McDowell traveled to Green River, Utah, and Grand Junction, Colorado to view fish passage and particularly fish entrainment equipment installed by the U.S. Bureau of Reclamation (Bureau) as part of the Upper Colorado River Fish Recovery Implementation Program. In particular, we wanted to see the corrugated water screen recently installed by the Bureau and its contractors on the Green River Canal right bank just north of Green River, Utah (39.0753,-110.1472).

The corrugated water screen installed at this location is the first larger size installation of this recently invented screen. The multi-panel screen on the Green River Canal is approximately 44 feet long and 6.5 feet wide. It consists of multiple modular panels of corrugated screen set at a slight incline below a concrete weir. During our visit, about 10 days after installation, the canal was running about 80 cfs, with 60 cfs being screened and routed downstream into the canal, about 5 cfs being discharged across the screen face into the fish bypass channel, and about 15 cfs unscreened flow being discharged downstream beyond the weir, and falling through a gate with a strong vertical drop, to avoid excessive sedimentation in the settling area above the weir. The Bureau contracted with Wild Fish Engineering (Brent Mefford) to provide the screen and the screen set-up and tuning.

Corrugated screen when dry. Looking downstream into the gated slot that allows sediment to be carried back to river. Not all screen setups will have this feature, but sediment is a huge problem on Colorado River.

PHOTO 1: Top of weir wall where screen begins. Note special screen cleaning brushes in background.

The incline on this screen is adjustable, by turning screws on the underside of the upper end of the screen (see PHOTO 3). This setup had approximately 2.5 percent slope into the fish bypass, resulting in velocities of 4 to 5 feet/second across the screen. Floating material moves across the screen in a matter of less than two (2) seconds. Once it crosses the weir, it is highly improbable that a fish could hold itself on the screen for more than a couple seconds.

The Bureau works with the US Fish and Wildlife Service (USFWS) on tracking federally endangered fish of the Upper Colorado. The primary species they are tracking in this area are Colorado Pikeminnow and Humpback Chub, which vary in size from fry to three-foot long adult pikeminnows. Some of the native fish species spawn immediately above the Green River Canal diversion dam, and the fry move passively with the current, which is why it is deemed essential to screen this canal for native fish recovery, even though the flow diverted (80 cfs) is a minor part of the total river flow (approximately 2000 cfs while we were there, goes down to 800 cfs).

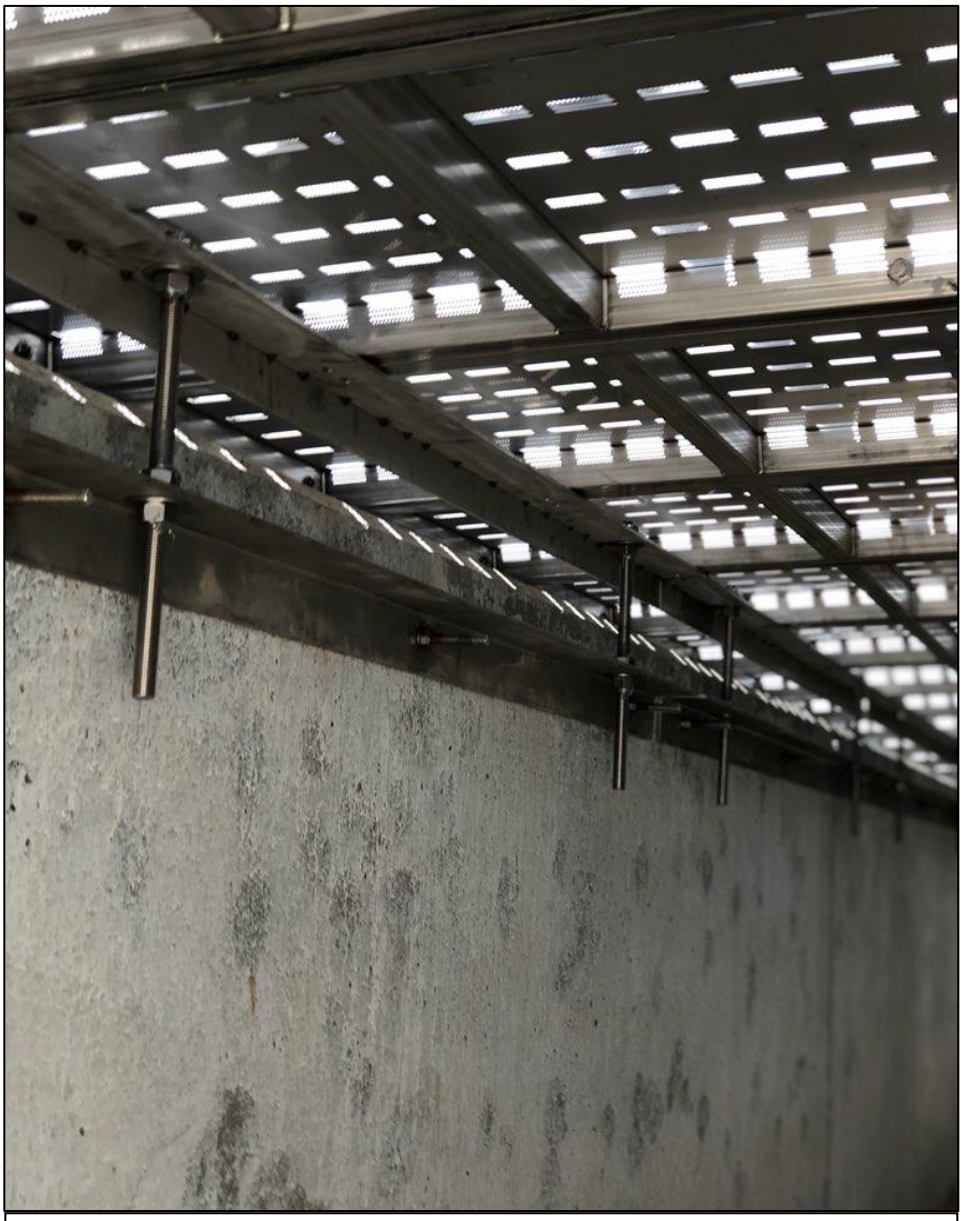
Tagged fish are tracked by USFWS using PIT tags and sensor arrays both above and below the screens and dams. In the first 10 days of operation the USFWS has already detected fish being passed over the Green River Canal corrugated screen, as well as fish swimming back out of the canal after encountering the screen weir. One interesting fact is that the concrete weir wall at the upper end of the screen is a deterrent to fish going over the screen. The native Colorado river fish are bottom-dwelling in habit, similar to the bull trout, and hesitate to swim to the surface to go over the weir, especially since flow over the weir is shallow. The Bureau has found in some sites in the Upper Colorado that simply passing the entire canal flow over a projecting vertical weir will deter many fish from traveling further down the canal, even without a screen, hence fewer fish are actually exposed to screens.

Cleaning the screen is necessary on the Colorado River, due to very heavy organic matter (slime) suspended in the water column of the very silty river water. The need for cleaning is approximately every two to three days at this facility. The cleaning is done using a special brush provided by the screen inventor, so that spiral brushes fit perfectly between the corrugations. Brushing from the bottom up, against the flow appears to be most effective, hence, a gangplank over the fish return canal is the best place to stand while brushing upward on the screen.

In smaller installations the modular screens can simply be set on angle iron in the box (either concrete or pre-fabricated steel). Hence, removal of smaller screen panels, if necessary, can be done by hand, or with a small piece of machinery, depending on panel size. Or the panels can be bolted in place.

PHOTO 2: Close up of corrugated water screen on Green River Canal in operation April 16, 2019. Note high water velocity, hydraulic jump and submergence of bottom of screen below my hand. Submergence increases screen intake, but can be reduced, if desired, by adjusting the outlet of the bypass channel, creating a small dropoff at end of screen.

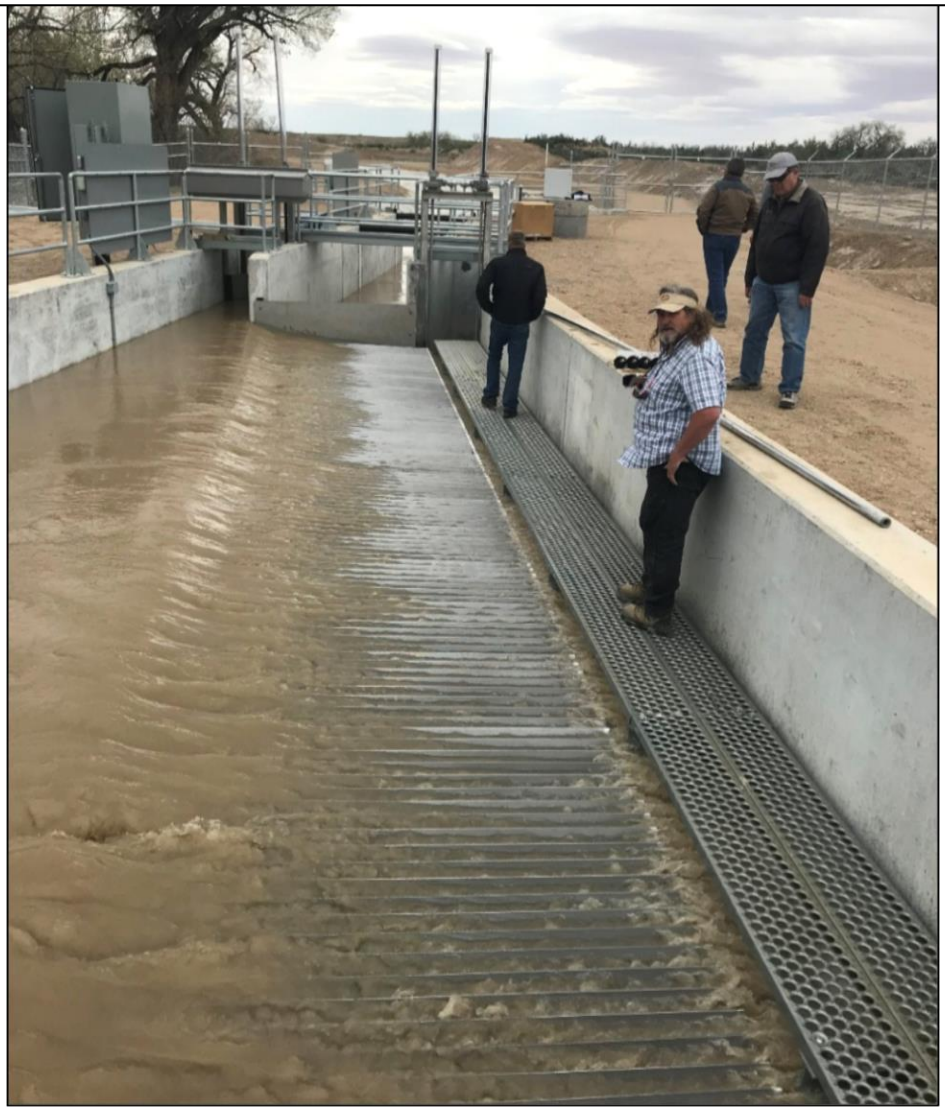
The screen is made of stainless steel, with corrugations about 2.75 inches tall. The peaks are about 3.5 inches apart. The bottom of the trough is smooth stainless steel and the trough is 0.5 inch wide at the bottom, and widens as it ascends towards peaks of each corrugation. The first 0.37 inch up from the sides of troughs are smooth, and then the punch-plate holes (0.0938 inch or 3/32 inch) begin and go up and over the corrugations. The total open area of the screen is about 40 percent. The double baffle plates under the screen (PHOTO 3) are adjusted to between 10% and 20% open area, depending on the flow, to assure adequate bypass flow. The adjustment of the screen incline and the baffle plates should only need to be done once, at installation. Wild Fish Engineering was onsite to adjust incline and baffles at this site during installation and pre-testing.



Adjustable double baffle plates under the screen control the flow through the system, not the screen open area. Baffles should only have to be set once at screen installation. Note the bolts and nuts which are used to set the incline of the screen at installation. This allows you to adjust sweeping velocity across screen.

West Fork Bitterroot Wilson Ditch fish screen

Green River Canal fish screen in full operation with 60 cfs passing through screen. Bypass flow is going under the catwalk on right and back to river. One adjustment will be to raise the catwalk higher above the bypass flow to allow larger debris to exit easily. A gate at end of bypass channel controls whether there is backwater or a drop-off from screen to bypass channel. Obviously bypass channel must be well-watered to cushion fish coming off screen if there is a drop. Some flow is exiting at the gated slot sediment sluice in the upper left part of picture—in many installations this gate would be closed, and only opened occasionally to sluice out sediment. Pictured are Brent Mefford (inventor), the BuRec civil engineer designer/project manager and BuRec engineering supervisor from Denver. BuRec is favorably impressed with this screen for use with endangered Colorado River fish. BuRec Upper Colorado project has designed, built, and field-tested various types and scales of fish screens for over 15 years, up to a vertical plate traveling brush screen in western Colorado that has a 1640 cfs capacity. They cite ease of operation and maintenance as a big advantage of this screen type, as well as the hydraulic performance documentation from laboratory.



West Fork Bitterroot Wilson Ditch fish screen

USDA United States Department of Agriculture
Forest Service
West Fork Ranger District
6735 West Fork Rd.
Darby, MT 59829
406-821-3269

File Code: 2620

Date: November 26, 2018

Christine Brissette
Trout Unlimited
Special Projects Manager
312 N. Higgins, Suite 200
Missoula, MT 59802

Christine:

The Wilson irrigation ditch and its point of diversion is located on the West Fork Ranger District of the Bitterroot National Forest. As the surrounding landowner, the West Fork District supports the installation of a fish screen on the Wilson irrigation ditch.

The Wilson ditch would remove water from a section of the West Fork Bitterroot River that is designated as critical habitat for bull trout and provides spawning and juvenile rearing habitat for bull trout. The presence of a fish screen would greatly reduce the risk of juvenile and young-of-the-year bull trout from becoming entrained in the ditch and perishing. The fish screen would also reduce/prevent losses of Westslope cutthroat trout, another native species that commonly occurs in the West Fork Bitterroot River near the point of diversion.

The District appreciates your efforts to get a fish screen installed on the Wilson ditch.

Sincerely,

SETH A. CARBONARI
West Fork District Ranger
Bitterroot National Forest

11/27/2018

Christine Brissette
Trout Unlimited
312 North Higgins
Suite 200
Missoula, Mt 59802

Dear Christine:

I have reviewed your application for a fish screen on the Wilson Ditch, which diverts water from the West Fork Bitterroot River upstream of Painted Rocks Reservoir. This is a well thought out project that is the result of a comprehensive review of ditches in the Bitterroot drainage. I support your Future Fisheries application.

You and others completed the Upper Bitterroot Irrigation Diversion Inventory and Prioritization Study in 2017 that identified priority ditches for screening. This ditch was rated as a high priority and is located in a reach of stream that should support Bull Trout and Westslope Cutthroat Trout well into the future according to the Cold Water Climate Shield report.

While I have not seen a Corrugated Water Screen, I did review the website and the screen should require less maintenance than the other screens in the Bitterroot Valley. If you would like, I will try to attend the meeting and support this project when the Future Fisheries panel meets.

Sincerely,

Chris Clancy

Chris Clancy
Fisheries Biologist